

# Recent Eastern Pacific Species of the Bivalve Genus *Semele*

by

EUGENE V. COAN

Research Associate, Department of Invertebrate Zoology, California Academy of Sciences,  
Golden Gate Park, San Francisco, California 94118, U.S.A.

*Abstract.* Twenty-eight living species-level taxa of the genus *Semele* are recognized in the eastern Pacific, including one new species from the Panamic province, *S. jamesi*. Many type specimens are illustrated, some for the first time, and several lectotype and two neotype designations are made. A number of nominal taxa are relegated to synonymy. Each species is described and illustrated, and its distribution and habitat are discussed.

## INTRODUCTION

A few years ago, I reviewed the northeastern Pacific species of the Semelidae, including that area's five species of *Semele* (COAN, 1973). I realized then that the far more diverse tropical and southern temperate eastern Pacific species of *Semele* were in even greater need of systematic attention. Indeed, I later worked out the nomenclatural confusion surrounding *S. formosa* (Sowerby) (COAN, 1983).

I have now examined the available type material of all of the Recent taxa of *Semele* from southern Alaska to southern Chile, as well as most of the available museum material, and the results are presented here.

The genus *Semele* is particularly abundant in the eastern Pacific, where 28 valid living taxa occur (Table 1). This is in contrast to only five in the western Atlantic, where the genus was well represented in the Tertiary. I have no idea why *Semele* became such a dramatic paciphile, because species of the genus occur in a variety of habitats and substrates. The western Atlantic species were most recently reviewed by BOSS (1972). They are: *Semele proficua* (Pulteney, 1799); *S. modesta* (Reeve, 1853); *S. purpurascens* (Gmelin, 1791); *S. casali* Doello-Jurado, 1949; and *S. bellestriata* (Conrad, 1837). Of these, *S. purpurascens* also occurs in the eastern Pacific. Other species are closely related to eastern Pacific taxa—*S. proficua* to *S. lenticularis* (Sowerby, 1833); *S. casali* to *S. venusta* (Reeve, 1853); and *S. bellestriata* to *S. verrucosa pacifica* Dall, 1915.

Because of their large and colorful shells, some species of *Semele* were covered in some early illustrated works, notably those of SOWERBY (1833a), REEVE (1841, 1853), and HANLEY (1857). Other nomenclaturally significant

treatments of the genus, in which the many eastern Pacific taxa figure prominently, include those by SOWERBY (1833b), HANLEY (1842-1856), TRYON (1869), and LAMY (1913). These and other works with figures or of nomenclatural importance are cited in my synonymies. Not cited in the synonymies are the species lists of MÜLLER (1836:221-224), RÉCLUZ (1845:410), and D'ORBIGNY (1845:531-534), checklists for particular localities, or popular works.

Particularly significant works specifically on eastern Pacific species are those of DALL (1915), HERTLEIN & STRONG (1949), KEEN (1958, 1971), and OLSSON (1961).

## FORMAT

In the following treatment, each valid taxon is followed by a synonymy, information on type specimens and type localities, notes on distribution and habitat, and additional remarks.

The synonymies include all major accounts of the species, but not minor mentions in the literature. The entries are arranged in chronological order under each species name, with changes in generic allocation from the previous entry, if any, and other notes in brackets.

The distributional information is based on specimens I have examined, except as noted. For many species, the habitat information is surprisingly sparse; depth is generally indicated on labels, but substrate type is often not. I have summarized what data I could find. Occurrences in the fossil record are taken from the literature, though occasionally questioned. The extensive fossil records for California are summarized, not cited in full.

References are provided in the Literature Cited for all works and taxa mentioned.

The following abbreviations for institutional and private collections are used in the text.

- AMNH—American Museum of Natural History, New York  
 ANSP—Academy of Natural Sciences of Philadelphia  
 BM(NH)—British Museum (Natural History)  
 CAS—California Academy of Sciences, San Francisco  
 CASGTC—former numbers of the CAS Geology Type Collection  
 LACM—Los Angeles County Museum of Natural History  
 MCZ—Museum of Comparative Zoology, Harvard University  
 NRS—Naturhistoriska Riksmuseet, Stockholm  
 PRI—Paleontological Research Institution, Ithaca, New York  
 SBMNH—Santa Barbara Museum of Natural History  
 SDNHM—San Diego Natural History Museum  
 SUPTC—former numbers of the Stanford University Paleontology Type Collection  
 TU—Tulane University  
 UCMF—University of California at Berkeley, Museum of Paleontology  
 USNM—U.S. National Museum collection, in the National Museum of Natural History, Washington, D.C.  
 UZM—Universitetets Zoologiske Museum, Copenhagen
- Evans Coll.—Collection of Roger A. Evans, Redondo Beach, California  
 McClincy Coll.—Collection of Richard McClincy, Tucson, Arizona  
 Poorman Coll.—Collection of LeRoy Poorman, Westminster, California  
 Shy Coll.—Collection of Laura B. Shy, Seal Beach, California  
 Skoglund Coll.—Collection of Carol C. Skoglund, Phoenix, Arizona  
 Swoboda Coll.—Collection of Ed Swoboda of Beverly Hills, California

A "pair" denotes the two valves of a single individual. The term "convexity" is used here instead of "thickness" for overall shell width to prevent confusion with the thickness of shell material.

In addition to designating a number of lectotypes, I have designated two neotypes to ensure nomenclatural stability, following the guidance of ICZN Code Art. 75 and its recommendations. In some cases, type localities have been restricted, following ICZN Recommendation 72H(a)4.

I have provided coordinates for type localities and key distributional records. These are given to the nearest minute, except when more precise numbers were already available.

## SYSTEMATIC ACCOUNT

### SEMELIDAE Stoliczka, 1870 [1850]

- Semelidae STOLICZKA, 1870:108 [1850] [as Semelinae] [Semelidae is maintained and takes precedence from Amphidesmatidae Deshayes, 1850; ICZN Code Art. 40b and Recommendation 40A].  
 =Amphidesmatidae DESHAYES, 1850:317–361 [as "Famille Les Amphidesmides," ex Latreille MS].  
 =Scrobiculariidae H. & A. ADAMS, 1856:408 [as Scrobiculariinae].  
 =Cumingiinae STOLICZKA, 1870:107.

The characteristics of the supposedly separable families Semelidae and Scrobiculariidae were reviewed by BOSS (1982:1145), who noted that there are not many significant features differentiating them. I suspect that one reason workers have not placed them together is that the less familiar name Scrobiculariidae was thought to pre-date the more familiar Semelidae. Having assured myself that this is not the case, because Semelidae takes precedence from the proposal of Amphidesmatidae in 1850, I place the scarcely distinguishable Scrobiculariidae into synonymy.

The characters that have been advanced for recognizing two families are the smooth shell of the Scrobiculariidae, the lack of lateral teeth in this family, and its smooth, homorhabdic ctenidia. However, some generic units that have traditionally remained in the Semelidae have smooth shells (e.g., *Abra*, *Leptomya*, *Theora*) and lack lateral teeth (*Thyellisca*, *Souleyetia*) (KEEN, 1969:635–637). The generalization about the ctenidia was made in the absence of information about most genera.

### *Semele* Schumacher, 1817

- Semele* SCHUMACHER, 1817:53, 165–166; pl. 18, fig. 2.  
**Type species:** *Tellina reticulata* SPENGLER, 1798:115, non LINNAEUS, 1767:1119; by monotypy; = *Tellina proficua* PULTENEY, 1799:29; pl. 5, fig. 4.—Western Atlantic.

BOSS (1972), who treated the western Atlantic species of *Semele*, provided a detailed account of morphological features of the genus and examined the anatomy of *Semele purpurascens* (Gmelin). He also reviewed previous work on the anatomy of other species of the genus, including the monograph on the Chilean *S. solida* (Gray) by SCHRÖDER (1916) but not the treatment of FISCHER (1857:334–339; pl. 13, fig. 5) on *S. proficua* (Pulteney).

The subgenera I have used under *Semele* may not represent monophyletic units, but they are convenient morphological groupings in a genus with so many species. In addition to the generic units discussed below, KEEN (1969:636) lists *Syndesmyella* Sacco, 1901 (SACCO, 1901:122–123, 210; pl. 16, figs. 29, 30), as a synonym of *Semele*, but it appears to be more closely related to *Abra* (BOSS, 1972:8); its type species, by original designation, is *S. plioovoides* Sacco, 1901 (misspelled by both Keen and Boss as *S. "plioovoides"*).

The word *desma* is a Greek term for "band" or "bundle" and is a neuter noun. Adjectives combined with it should have neuter endings. This is also true of words derived from it, such as *Amphidesma* ("divided ligament"). Thus, it should have been *A. solidum*, not *A. solida* as GRAY (1828) spelled it. Such incorrect terminations are to be automatically corrected (ICZN Code Arts. 31c, 32d(ii)). *Semele*, on the other hand, was based on a Greek goddess,<sup>1</sup> and adjectives combined with it should have feminine terminations. Thus, it should be *Semele solida* (Gray).

(*Semele*), *s.s.*

The taxa included here are mostly rounded in outline, thick-shelled, and live in shallow water in the sand matrix among rocky rubble.

*Semele* (*S.*) *bicolor* (C. B. Adams, 1852)

(Figures 1–3)

*Amphidesma bicolor* C. B. Adams, 1852: C. B. ADAMS, 1852a: 512–513, 547 [1852b:288–289, 323]; CARPENTER, 1857b: 279, 303 [*Semele*]; CARPENTER, 1864a:367 [1872:203]; CARPENTER, 1864b:543, 553, 619 [1872:29, 39, 105]; TRYON, 1869:122 [as a synonym of *S. venusta*]; LAMY, 1913:356, footnote; DALL, 1915:26; TURNER, 1956:35, 128–129; pl. 18, figs. 7, 8; KEEN, 1958:195; fig. 477; KEEN, 1971:249–250; fig. 625; BERNARD, 1983:46; GEMMELL *et al.*, 1987:54; fig. 65.

*Semele fucata* Mörch, 1860: MÖRCH, 1860:190; KEEN, 1966b: 12, 13, 16; fig. 16a, b [as a synonym of *S. bicolor*].

**Type material and localities:** *A. bicolor*—MCZ 186504, holotype, right valve; length, 20.5 mm; height, 18.6 mm; convexity, 4.9 mm [pair would be about 9.8 mm] (Figure 1). Panama, presumably near Panama City (about 8°58'N, 79°32'W); C. B. Adams, 27 Nov. 1850–2 Jan. 1851.

*S. fucata*—UZM [no #], lectotype (KEEN, 1966b:12), right valve; length, 13.8 mm; height, 12.1 mm; convexity, 2.8 mm [pair would be about 5.6 mm] (Figure 2). UZM, paralectotypes, 1 pair, 3 valves. [Depto.] Sonsonate, El Salvador (about 13°N, 90°W).

**Description:** Small (length to 31.3 mm; SBMNH 31076; Guaymas, Sonora, Mexico); rounded; equivalve; shells thin; slightly longer, rounded anteriorly; slightly truncate posteriorly; antero-dorsal margin slightly concave near beaks, with a small lunule; postero-dorsal margin straight to slightly convex, with an escutcheon, larger in left valve; posterior end slightly flexed, more evident in right valve. Periostracum thin, tan. Sculpture of concentric growth

<sup>1</sup> *Semele* was the daughter of King Cadmus of Thebes. She was loved by Zeus. Hera, prompted by jealousy, persuaded Semele to ask Zeus to appear before her in all his glory. When Zeus complied, Semele was consumed by lightning, after giving birth to a son of Zeus, Dionysus, who later found Semele in Hades and took her to Olympus.

Table 1

The Recent eastern Pacific species of *Semele*.

---



---

<i>Semele</i> ( <i>Semele</i> ) <i>bicolor</i> (C. B. Adams, 1852)
<i>S. (S.) californica</i> (Reeve, 1853, ex A. Adams MS)
<i>S. (S.) corrugata</i> (Sowerby, 1833)
<i>S. (S.) decisa</i> (Conrad, 1837)
<i>S. (S.) elliptica</i> (Sowerby, 1833)
<i>S. (S.) flavescens</i> (Gould, 1851)
<i>S. (S.) lenticularis</i> (Sowerby, 1833)
<i>S. (S.) pilsbryi</i> Olsson, 1961
<i>S. (S.) rubropicta</i> Dall, 1871
<i>S. (S.) solida</i> (Gray, 1828)
<i>S. (S.) sowerbyi</i> Tryon, 1869
<i>S. (S.) tortuosa</i> (C. B. Adams, 1852)
<i>S. (Amphidesma) craneana</i> Hertlein & Strong, 1949
<i>S. (A.) formosa</i> (Sowerby, 1833)
<i>S. (A.) pallida</i> (Sowerby, 1833)
<i>S. (A.) purpurascens</i> (Gmelin, 1791)
<i>S. (A.) venusta</i> (Reeve, 1853, ex A. Adams MS)
<i>S. (Elegantula) rupicola</i> Dall, 1915
<i>S. (E.) rupium</i> (Sowerby, 1833)
<i>Semele, s.l.</i>
[group of <i>S. barbarae</i> ]
<i>S. barbarae</i> (Boone, 1928)
<i>S. jovis</i> (Reeve, 1853, ex A. Adams MS)
<i>S. rosea</i> (Sowerby, 1833)
[group of <i>S. guaymasensis</i> ]
<i>S. guaymasensis</i> Pilsbry & Lowe, 1932
<i>S. pulchra</i> (Sowerby, 1832)
<i>S. verrucosa verrucosa</i> Mörch, 1860
<i>S. verrucosa pacifica</i> Dall, 1915
[no group]
<i>S. jamesi</i> Coan, sp. nov.
<i>S. laevis</i> (Sowerby, 1833)

---



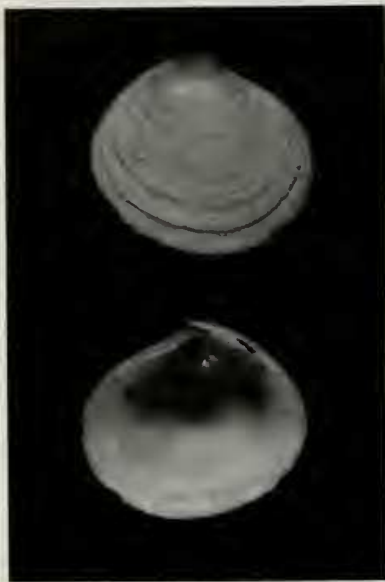
---

lines and fine radial striae. White externally, with dark purple umbones and a white radial patch on anterior slope of beaks; internally with a purplish suffusion; some specimens with tan flecks on postero-dorsal margin. Pallial sinuses medium in size. Hinge plate narrow.

Figure 3 depicts an adult pair from Sonora, Mexico (CAS 064674), in better condition than either of the two types.

**Distribution and habitat:** In the Gulf of California from Bahía Willard, Baja California Norte (29°49'N, 114°24'W) (SDMNH 90020), and Puerto Lobos, Sonora (30°13'N, 112°50'W) (CAS 064523), to Mancora, Piura Prov., Peru (4°6'S, 81°4'W) (SBMNH 34904). Most material has been obtained in beach drift. The available records indicate a habitat from the lower intertidal zone to 20 m (mean, 3 m); on sand (GEMMELL *et al.*, 1987:54). I have examined 66 lots.

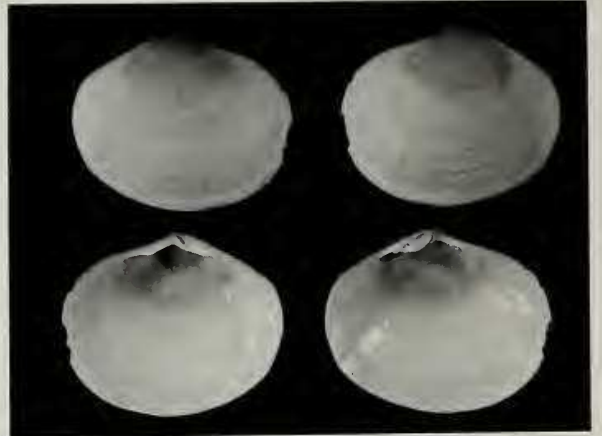
This species has been reported (as "cf.") from Pliocene strata on Isla Carmen, Baja California Sur (EMERSON & HERTLEIN, 1964:341, 350).



1



2



3



4



5



6

**Remarks:** KEEN (1966b) showed that Mörch's *Semele fucata* is a synonym of *S. bicolor*. However, *Amphidesma striosum* and *A. ventricosum* of C. B. Adams, which she relegated to synonymy here as well, belong instead as synonyms elsewhere.

The distinctive purple color on the umbones of this species is its hallmark. This character, however, is difficult to see in faded, beachworn valves, and I have found no other character to differentiate such material from *Semele lenticularis* (Sowerby) of similar condition.

CARPENTER's (1857c:28) record of *Semele venusta* (Reeve) from Mazatlán, Sinaloa, he later decided was based on this species (CARPENTER, 1864a:367; 1864b:543, 553). Confused, TRYON (1869) synonymized the two unrelated taxa.

*Semele (S.) californica* (Reeve, 1853, ex A. Adams MS)

(Figure 4)

*Amphidesma californica* Reeve, ex A. Adams MS: REEVE, 1853:pl. 3, fig. 19 [as "A. Adams"]; A. ADAMS, 1854: 96 [*Semele*]; CARPENTER, 1857b:287, 289, 303; 1864b: 619, 665 [1872:105, 151]; TRYON, 1869:119; LAMY, 1913: 359-360; DALL, 1915:25 [as a probable synonym of *S. corrugata*]; BURCH, 1945a:18; 1945b:17; HERTLEIN & STRONG, 1949:240-241 [as a subspecies of *S. corrugata*]; KEEN, 1958:195-196; fig. 478 [as a subspecies of *S. corrugata*]; OLSSON, 1961:362 [as a synonym of *S. flavescens*]; KEEN, 1971:249-250; fig. 626; COAN, 1973: 325; BERNARD, 1983:46.

**Type material and locality:** BM(NH) 1986065/1, **lectotype (here designated)**, the figured specimen, pair; length, 41.7 mm; height, 37.8 mm; convexity, 17.8 mm (Figure 4). BM(NH) 1986065/2, 3, paralectotypes. "Gulf of California," **here restricted to La Paz, Baja California Sur** (24°10'N, 110°19'W), Mexico.

**Description:** Medium-sized (length to 42.0 mm; SBMNH 34906; Bahía Magdalena, Baja California Sur); rounded; right valve slightly more inflated; shells average to heavy in thickness; approximately equilateral; rounded anteriorly; slightly truncate posteriorly; antero-dorsal margin straight to rounded, with a lunule; postero-dorsal margin rounded, with an indistinct escutcheon. Periostracum thin, brown. Sculpture of heavy, wavy concentric ribs, especially

evident near ventral margin, and fine radial threads. White externally, sometimes with reddish flecks on dorsal margin and escutcheon; generally yellow to orange within, darkest along ventral margin. Pallial sinuses small. Hinge plate heavy.

**Distribution and habitat:** This species has a very restricted distribution in Mexico: Bahía Santa María, Baja California Sur (24°45'N, 112°15'W) (USNM 264777), into the western Gulf of California as far north as Bahía San Luis Gonzaga, Baja California Norte (29°45'N, 114°20'W) (SBMNH 34905); and in eastern Gulf on the Sonoran coast from Isla Venado (27°57'N, 111°9'W) (ANSP 354936) to Guaymas (27°50'N, 110°54'W) (LACM 124455). Nearly all the material has been collected in beach drift, but the limited data available suggest that this species nestles in rocky rubble from the low intertidal zone to 3 m. I have examined 64 lots.

A lot labeled Isla San Martín, Baja California Norte (SDNHM 91334), is probably the result of an error from the mixing of previously unnumbered material. Records of this species from California (WILLIAMSON, 1892:186; KEEP, 1904:86; 1910:97; KEEP & BAILY, 1935:107) are in error, and were perhaps based on misidentified specimens of *Semele decisa* (Conrad).

Records of this species from Japan (SCHRENCK, 1867: 569-570, 972; pl. 22, fig. 10; DUNKER, 1882:195) were probably based on specimens of *Semele cordiformis* (HOLTEN, 1803:10).

HERTLEIN & STRONG (1949:241) reported this species from strata of Pleistocene age at Bahía Magdalena, Baja California Sur, and HERTLEIN (1957:63) from similar strata on Isla Carmen, at the southern end of the Gulf of California. OLSSON (1942:10) noted it in Pleistocene deposits on the Burica Peninsula, Costa Rica (as "cf."), an improbable record.

**Remarks:** This species accounts for early records of the South American *Semele corrugata* (Sowerby) from Baja California (for example, STEARNS, 1894:156). HERTLEIN & STRONG (1949), followed by KEEN (1958), then made this distinctive Gulf of California species a subspecies of *S. corrugata*.

*Semele (Semele) corrugata* (Sowerby, 1833)

(Figures 5, 6)

*Amphidesma corrugatum* Sowerby, 1833: SOWERBY, 1833a:1 [7] [*nomen nudum*]; cites only a figure in his unpublished "Species Conchyliorum"; SOWERBY, 1833b:200; HANLEY, 1843:44; 6; pl. 12, fig. 21 [not pl. 12, fig. 5, which is *S. flavescens*]; 1856:341; REEVE, 1853:pl. 1, fig. 4; HANLEY, 1857:pl. 2, fig. 13; CARPENTER, 1864b:640 [1872:126] [*Semele*]; TRYON, 1869:119; DALL, 1909:271; LAMY, 1913:361-362; DALL, 1915:25; HERTLEIN & STRONG, 1949:241, footnote; OLSSON, 1961:359, 361, 537; pl. 64, fig. 1; KEEN, 1971:249-250; fig. 627; BERNARD, 1983:46.

*Amphidesma croceum* Gould, 1850: GOULD, 1850:218; GOULD,

#### Explanation of Figures 1 to 6

Figures 1-3. *Semele (S.) bicolor* (C. B. Adams). Figure 1: Holotype of *Amphidesma bicolor*; length, 20.5 mm. Figure 2: Lectotype of *S. fucata* Mörch; length, 13.8 mm. Figure 3: CAS 064674; Bahía Algodones, Sonora, Mexico; length, 26.0 mm.

Figure 4. *Semele (S.) californica* (Reeve). **Lectotype** (herein) of *Amphidesma californica*; length, 41.7 mm.

Figures 5 and 6. *Semele (S.) corrugata* (Sowerby). Figure 5: **Lectotype** (herein) of *Amphidesma corrugatum*; length, 89.5 mm. Figure 6: Holotype of *A. croceum* Gould; length, 83.0 mm.

1852:399; 1860:pl. 35, figs. 512a, b; 1862:78, 246; TRYON, 1869:119 [*Semele*]; LAMY, 1913:361, footnote; DALL, 1915:25 [as a synonym of *S. solida*]; JOHNSON, 1964:62; BERNARD, 1983:47 [as a synonym of *S. solida*].

*Semele solida* (Gray), *auclt.*, *non* Gray, 1828: DALL, 1909: 294, pl. 28, fig. 10.

[*non* GRAY, 1828:6].

**Type material and localities:** *A. corrugatum*—BM(NH) 1986067, **lectotype (here designated)**, the specimen figured by REEVE (1853), pair; length, 89.5 mm; height, 81.4 mm; convexity, 46.2 mm (Figure 5). BM(NH) 1986066, paralectotype, the syntype measured by Sowerby, pair; length, 53.1 mm; height, 48.6 mm; convexity, 25.0 mm. BM(NH) 1986068/1, 2, additional paralectotypes. "Peru and Iquique," 18 m, coarse gravel; H. Cuming, 1828–1830. These specimens probably came from Peru; I have not seen this species from as far south as Iquique, Tarapaca Prov., Chile. **I here restrict the type locality to Paita, Piura Prov., Peru (5°5'S, 81°7'W)**, where the species is present (USNM 48451).

*A. croceum*—USNM 5899, holotype, pair; length, 83.0 mm; height, 75.1 mm; convexity, 40.0 mm (Figure 6). "Callao?," Lima Prov., Peru (12°3'S, 77°10'W); U.S. Exploring Expedition, June–July 1839 (TYLER, 1968:74–77).

**Description:** Large (length to 97.8 mm; ANSP 275950; Laguna Grande, Ica Prov., Peru); right valve decidedly more inflated; shells heavy; approximately equilateral to longer anteriorly; rounded anteriorly; slightly truncate posteriorly; antero-dorsal margin concave near beaks, convex anteriorly, with a slight lunule; postero-dorsal margin straight, slightly convex, with a slight escutcheon in left valve. Periostracum straw-colored to dark brown, present only as ventral shreds in adult. Sculpture of thin concentric ribs, which are strongest anteriorly and fade out toward posterior slope, and fine radial threads. White externally; internally generally bright orange or yellow (occasionally white), with a purplish stain at ends of hinge. Pallial sinuses large. Anterior lateral tooth in right valve small, not projecting ventrally.

**Distribution and habitat:** Santa Elena, Guayas Prov., Ecuador (2°12'S, 80°52'W) (HOFFSTETTER, 1952:41, as "*S. solida*"; OLSSON, 1961; I have not seen specimens from this far north but find little reason to doubt these records); between El Rubio and Punto Mero, Piura Prov., Peru (3°54'S, 80°53'W) (LACM 72-85, 2 juveniles); Negritos, Piura Prov., Peru (4°40'S, 81°19'W) (OLSSON, 1961); Punta Parinas, Piura Prov., Peru (4°40'S, 81°20'W) (USNM 424414), to Laguna Grande, Bahía de Independencia, Ica Prov., Peru (14°8'S, 76°15'W) (USNM 537934, 537942; LACM 72-77; SBMNH 34907, 34908; ANSP 275950, 300982). Depth records are from the intertidal zone to 9 m (mean, 5 m). The only substrate types noted on labels are in sand or among rocks. I have examined 49 lots.

STEARNS (1891:313), repeated by DALL (1909:271), reported this species from the Gulf of Panama, but there is

no material in any collection to support this unlikely record. Reports of it from Baja California (STEARNS, 1894: 156) were based on specimens of *Semele californica* (Reeve). HERTLEIN & STRONG's (1955a:123) record of it from Isla Baltra in the Galápagos Islands was based on a specimen of *S. flavescens* (Gould) (CAS 064672).

One specimen labeled as coming from Valparaiso, Chile (USNM 73492), is probably mislabeled and may also account for OLSSON's (1961) Chilean record. GIGOUX (1935: 284) reported this species from Atacama Prov., Chile, and HUPÉ, in Gay (1854:360), reported it from "Valparaiso, etc.," I suspect that these records were based on specimens of *Semele solida* (Gray). SOOT-RYEN's (1959:63–64) records of this species from southern Chile were based on specimens of *S. solida* that I have examined (NRS).

LAMY (1910:C90) reported this species as a subfossil at Paita, Peru, which may be correct, and I suspect that HOFFSTETTER's (1948:80) record of *Semele solida* from Pleistocene strata on the Santa Elena Peninsula, Ecuador, is really *S. corrugata*, as may be BOSWORTH's (1922:178) record from Pleistocene strata at Lobitos, Piura Prov., Peru.

**Remarks:** This species is easily confused with *Semele solida* (Gray). The latter has a more southern distribution, the two overlapping between Callao and Bahía Independencia, Peru. *Semele corrugata* (1) attains a larger size; (2) is often yellow or orange within; (3) is more inequivalve, with the right valve conspicuously more inflated; (4) is often less equilateral, being longer anteriorly (*S. solida* is generally equilateral); (5) has more subdued concentric sculpture on the posterior slope (in *S. solida*, it is subdued on the anterior slope instead); (6) has a smaller, more horizontally directed anterior lateral tooth in the right valve (in *S. solida*, it is larger and more ventrally directed); and (7) has a smaller lunule.

Some authors have synonymized *Amphidesma croceum* with *Semele solida*, but it belongs here.

*Semele (Semele) decisa* (Conrad, 1837)

(Figures 7, 8)

*Amphidesma decimum* Conrad, 1837: CONRAD, 1837:239; pl. 19, fig. 2 [as "*A. decisa*"]; HANLEY, 1843:44–45; 7; pl. 12, fig. 52; 1856:341; REEVE, 1853:pl. 4, fig. 24; CARPENTER, 1857a:213 [*Semele*]; 1857b:195, 228, 231, 303, 351; 1864b:536, 540, 640 [1872:22, 36, 126]; TRYON, 1869:119; ARNOLD, 1903:165–166; LAMY, 1913:357–358; DALL, 1915:25; I. OLDROYD, 1925:179; GRANT & GALE, 1931:376, 908; pl. 14, figs. 13a, b; BURCH, 1945a: 17, 19 (fig.); 1945b:17; HERTLEIN & STRONG, 1949: 239, 242; KEEN, 1966a:171; COAN, 1973:316–318; figs. 1, 2, 14; BERNARD, 1983:46.

*Amphidesma rubrolineatum* Conrad, 1837 [first revision: COAN (1973)]; CONRAD, 1837:239; pl. 18, fig. 11 [as "*A. rubrolineata*"]; HANLEY, 1843:44; 7; pl. 12, fig. 51; 1856:341; CARPENTER, 1857a:212 [*Semele*]; 1857b:163, 195, 232, 303, 351; 1864b:536, 640 [1872:22, 126] [as a possible synonym of *S. decisa*]; TRYON, 1869:122; DALL, 1871:

144; LAMY, 1913:363–364, footnote; DALL, 1915:27–28; KEEN, 1966a:171; COAN, 1973:316 [as a synonym of *S. decisa*].

?*Semele rubroincta* Carpenter, ex “Conrad” MS [*nomen nudum*; probably a misspelling of *S. rubrolineata*]; CARPENTER, 1857b:284, 352 [*nomen nudum*]; DALL, 1915:27.

?*Semele “californica* Conrad,” *auctt.*, ?error for *S. decisa* (Conrad); KEW, 1924:88.

*Semele “dehiscens,” auctt.*, misspelling of *S. decisa*: HARTMAN, 1963:88, 187.

**Type material and localities:** *A. decisum*—BM(NH) 1861.5.20.137, lectotype (COAN, 1973:316), pair; length, 48.1 mm; height, 44.0 mm; convexity, 21.0 mm (Figure 7). Conrad’s stated length of 127 mm would be larger than any known specimen and was probably in error. According to S. Morris (in correspondence, 13 June 1986), there was probably at least one other syntype; thus my calling this one a “holotype” in 1973 (COAN, 1973) constitutes a lectotype designation (ICZN Code Art. 74b). “In the vicinity of” San Diego, San Diego Co., California (approx. 32°42’N, 117°16’W); “in deep water”; T. Nuttall; 15 April–8 May 1836 (GRAUSTEIN, 1967:313–317).

*A. rubrolineatum*—Original lost (CARPENTER, 1864b:640; KEEN, 1966a:171). USNM 590481, **neotype (here designated)**, pair; length, 25.7 mm; height, 22.3 mm; convexity, 9.4 mm (Figure 8). USNM 665764, 3 pairs, 1 valve from the same lot. Original locality same as *A. decisum*. The neotype is from Mission Bay, San Diego Co., California (32°44’N, 117°14’W); W. K. Emerson; 11 Nov. 1946. A neotype is designated because the early date of this *nomen dubium* threatens nomenclatural stability. Conrad’s figure is not as good as one would like, but it was probably based on a young specimen of *S. decisa* not unlike the neotype selected.

**Description:** Large (length to 119.2 mm; Evans Coll., cited by DRAPER, 1987:38; Laguna Bay, Orange Co., California); rounded; right valve more inflated; shells average in thickness; slightly longer, rounded anteriorly; truncate posteriorly; antero-dorsal margin slightly concave, with a weak lunule; postero-dorsal margin straight, with an escutcheon (which may become obscure in large specimens). Periostracum light to dark tan, often present only as ventral shreds. Sculpture of heavy, irregular concentric folds and fine radial threads. White to tan externally; white internally, with purplish stains, especially on margins; hinge stained purple. Pallial sinuses medium in size.

KELLOGG (1915:658, 660; fig. 32) illustrated its ciliary currents.

**Distribution and habitat:** Point Arguello, Santa Barbara Co., California (34°34’38”N, 120°38’59”W) (CAS 064541), to Punta Entrada, Bahía Magdalena, Baja California Sur (24°32’N, 112°4’W) (LACM 71-14); ?Cabo San Lucas, Baja California Sur (22°52’N, 109°53’W) (CAS 064525, AMNH 78436, representing a single sample and not verified in recent years). Depth records are from the intertidal

zone to 46 m (mean, 5 m), buried in sandy rubble. I have examined 137 lots.

A lot labeled “Paso Robles” (LACM 57175), an inland town in San Luis Obispo Co., suggests a possible occurrence as far north as that county (approx. 35°38’N), but no reliable records confirm its occurrence there. A lot labeled “Puerto Peñasco,” Sonora (MCZ 233099), undoubtedly represents a labeling error, as probably does a lot labeled “Mazatlán,” Sinaloa (CAS 064524).

This species has been recorded by various authors from many localities in strata of late Pleistocene age from Tomales Bay, Marin Co., California (ADDICOTT, 1966:14, who summarizes previous records there), to Bahía Magdalena, Baja California Sur (JORDAN, 1936:112). It is also known from early Pleistocene strata in southern California (for example, ARNOLD, 1903; DELONG, 1941:244; CLARK, in Natland, 1957:pl. 2) and from Pliocene deposits of the Los Angeles basin (for example, WILLET, 1946:29).

**Remarks:** CARPENTER (1857a:212; 1857b:163, 195, 232), following the advice of Hugh Cuming, suggested that *Amphidesma simplex* Adams & Reeve, 1850 (ADAMS & REEVE, 1850:81; pl. 20, fig. 11), described from the “Sooloo Sea,” might actually be from California and be a synonym of *A. rubrolineatum* Conrad, 1837. However, the original figure of *A. simplex* and a photograph of the three syntypes in the BM(NH) show that the shells of this species are more elongate, and they were described as being golden within. Thus, there is no reason to doubt that *A. simplex* is an Asian taxon.

CARPENTER (1857a:213) repeated a suggestion of Gould that *Semele decisa* might prove to be a synonym of *S. rosea* (Sowerby). Later, CARPENTER (1857b:195, 228) decided that this was incorrect, calling this concept “Gld. (not Sow.)”

*Semele (Semele) elliptica* (Sowerby, 1833)

(Figure 9)

*Amphidesma ellipticum* Sowerby, 1833: SOWERBY, 1833a:1 [7] [*nomen nudum*; cites only a figure in his unpublished “Species Conchyliorum”]; SOWERBY, 1833b:200; HANLEY, 1843:45; C. B. ADAMS, 1852a:513 [1852b:289]; REEVE, 1853:pl. 5, fig. 31; CARPENTER, 1857b:279, 303 [*Semele*]; 1857c:28; HANLEY, 1857:pl. 2, fig. 12; CARPENTER, 1864a:367 [1872:203]; CARPENTER, 1864b:553 [1872:39]; TRYON, 1869:120; DALL, 1909:271; LAMY, 1913:262–263; DALL, 1915:26; KEEN, 1958:196–197; fig. 480; OLSSON, 1961:359, 362, 537; pl. 64, fig. 5; CAUQUOIN, 1969:574; KEEN, 1971:249–250; fig. 629; BERNARD, 1983:46.

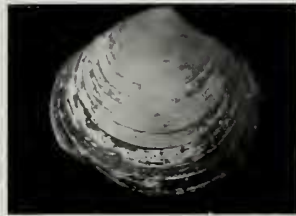
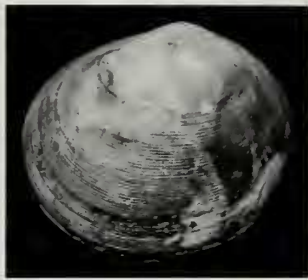
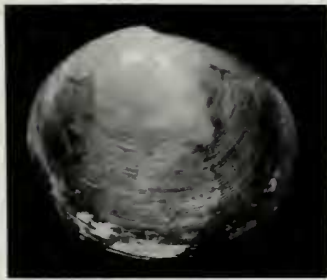
[Not to be confused with *A. ellipticum* KOCH & DUNKER, 1837:19, 64; pl. 1, fig. 3, an unrelated fossil taxon.]

**Type material and locality:** BM(NH) 1986070/1, **lectotype (here designated)**, the figured syntype, pair; length, 58.9 mm; height, 50.8 mm; convexity, 25.0 mm (Figure 9). BM(NH) 1986070/2, 3, paralectotypes. “Monte Christe” [Montecristi, inland from Manta], Manabi Prov.,



8

7



10

9



11



"W. Col." [Ecuador] (0°57'S, 80°44'W), 16 m, sandy mud; H. Cuming, 1828-1830.

**Description:** Medium-sized (to 75.5 mm; SDNHM 15840; Panama); elliptical; equivalve; shells average in thickness; much longer, rounded anteriorly; somewhat truncate posteriorly; antero-dorsal margin slightly rounded, with an elongate lunule; postero-dorsal margin slightly rounded, with a narrow escutcheon. Periostracum olive-brown, strongly adherent. Concentric sculpture regular, subdued, almost smooth in young specimens, then grooved, then of low, broad ribs. Shell white externally; internally white, sometimes with a pink flush; beaks white. Pallial sinuses small.

**Distribution:** Jiquilillo, Chinandega Depto., Nicaragua (13°N, 87°W) (LACM 86-267.1), to Punta Santa Elena, Guayas Prov., Ecuador (2°12'S, 80°58'W) (CAS 064526). PEÑA (1971:136) reported it from Puerto Pizarro, Tumbes Prov., Peru (3°29'S, 80°23'W), and this may be correct. It has been recorded only from the intertidal zone; the few habitat records indicate mud, sand, and rock substrates. I have examined 53 lots.

What was recorded by PARKER (1964a:161) as this species from the Playa Novillero area, Nayarit, Mexico, proves to be specimens of *Semele pallida* (Sowerby) (MCZ 260379, 260386). What was reported by SOOT-RYEN (1959:63) as this species from Iquique, Chile, is young *S. solida* (Gray) (NRS).

HOFFSTETTER (1948:80; 1952:41) reports this species from Pleistocene strata on the Santa Elena Peninsula, Ecuador, which is probably correct. HERM (1969:120) reports it from upper and middle Pleistocene strata in Chile, records that I regard with some doubt.

*Semele (S.) flavescens* (Gould, 1851)

(Figures 10, 11)

*Amphidesma flavescens* Gould, 1851: GOULD, 1851:89-90; GOULD, 1853:392-393; GOULD & CARPENTER, 1857: 199 [*Semele*]; CARPENTER, 1857a:548; 1857b:226, 231, 245, 279, 289, 303, 351 [misspelled as "*flavicans*" on pp. 231, 279, 289]; CARPENTER, 1857c:548; GOULD, 1862:211-212; CARPENTER, 1864a:367 [1872:203]; CARPENTER, 1864b:542, 553, 562, 619 [1872:29, 39, 48, 105]; TRYON, 1869:120; LAMY, 1913:358-359; DALL, 1915:25; I. OLDRYD, 1925:182; GRANT & GALE, 1931:

376; BURCH, 1945a:17; 1945b:17; HERTLEIN & STRONG, 1949:240, 242-243; DURHAM, 1950:90, 169, 170; pl. 24, fig. 2; pl. 25, fig. 10; KEEN, 1958:196-197; fig. 481; OLSSON, 1961:359, 362-363, 537; pl. 64, figs. 4, 4a, 4b; JOHNSON, 1964:77; pl. 29, fig. 7; CAUQUOIN, 1969:575; KEEN, 1971:249-251; fig. 630; COAN, 1973:325; BERNARD, 1983:46; GEMMELL *et al.*, 1987:55; figs. 66, 67.

*Amphidesma proximum* C. B. Adams, 1852: C. B. ADAMS, 1852a:513-514, 547 [1852b:289-290, 323]; REEVE, 1853: pl. 3, fig. 20; HANLEY, 1843:341-342; GOULD & CARPENTER, 1857:199; CARPENTER, 1857b:226, 231, 245, 279, 289, 303 [*Semele*]; CARPENTER, 1857c:28, 548; CARPENTER, 1864a:367 [1872:203] [as a synonym of *S. elliptica*]; CARPENTER, 1864b:553, 576, 668 [1872:39, 62, 154] [as a probable synonym of *S. elliptica*]; TRYON, 1869:120 [as a synonym of *S. elliptica*]; LAMY, 1913:359 [as a synonym of *S. elliptica*]; DALL, 1915:25 [as a synonym of *S. flavescens*]; TURNER, 1956:76-77, 128-129; pl. 18, figs. 14, 15.

*Amphidesma corrugatum* Sowerby, *auct.*, non Sowerby, 1833: HANLEY, 1843:6; pl. 12, fig. 5; 1856:341 [says fig. was *S. proxima*].

[non SOWERBY, 1833b:200].

*Semele "flavicans," auct.*, misspelling of *S. flavescens*: CARPENTER, 1857b:231, 279, 289; DALL, 1871:145.

*Semele "flavencens," auct.*, misspelling of *S. flavescens*: OLSSON, 1932:127.

**Type material and localities:** *A. flavescens*—MCZ 169157, lectotype (JOHNSON, 1964:77, as "holotype"—ICZN Code Art. 74b), pair; length, 58.0 mm; height, 52.8 mm; convexity, 28.0 mm (Figure 10). "San Diego, California" [in error]; T. P. Green. This specimen undoubtedly came from the Panamic province, and **I here correct the type locality to Guaymas, Sonora** (27°55'N, 110°53'W), where Green collected many other species (CARPENTER, 1857b:231-234) and where this species is common.

*A. proximum*—MCZ 186563, lectotype (TURNER, 1956: 128), pair; length, 44.6 mm; height, 42.0 mm; convexity, 20.2 mm (Figure 11). Panama, presumably from near Panama City (about 8°58'N, 79°32'W), reef at low tide; C. B. Adams, 27 Nov. 1850-2 Jan. 1851.

**Description:** Medium-sized (length to 69.0 mm; SBMNH 34909; Isla Santa Margarita, Baja California Sur); oval; equivalve; average in thickness to heavy; longer, rounded anteriorly; somewhat truncate posteriorly; antero-dorsal margin concave, with a small lunule; postero-dorsal margin straight, with a conspicuous escutcheon. Periostracum olive. Sculpture of thin, irregular concentric ribs and radial striae. White externally; white internally, sometimes with a yellowish or cream-colored hue (hence the name). Pallial sinuses medium in size.

**Distribution and habitat:** Isla Magdalena, Baja California Sur (24°35'N, 112°5'W) (LACM 67-70; CAS 055811), into and throughout the Gulf of California, to Negritos, Piura Prov., Peru (4°40'S, 81°19'W) (USNM 359655). GRANT & GALE (1931:376) cite a specimen from Laguna Ojo de Liebre (Scammon's), on the outer coast of Baja California (27°50'N, 114°15'W), but it cannot be located

←  
Explanation of Figures 7 to 11

Figures 7 and 8. *Semele (S.) decisa* (Conrad). Figure 7: Lectotype of *Amphidesma decisum*; length, 48.1 mm. Figure 8: Neotype (herein) of *A. rubrolineatum* Conrad; length, 25.7 mm.

Figure 9. *Semele (S.) elliptica* (Sowerby). Lectotype (herein) of *Amphidesma ellipticum*; length, 58.9 mm.

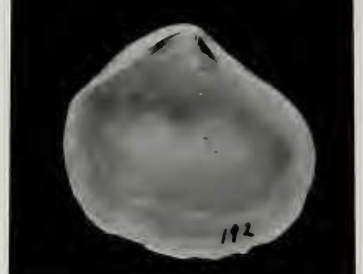
Figures 10 and 11. *Semele (S.) flavescens* (Gould). Figure 10: Lectotype of *Amphidesma flavescens*; length, 58.0 mm. Figure 11: Lectotype of *A. proximum* C. B. Adams; length, 44.6 mm.



12



13



14

15



16



17



18

for verification at the CAS (present home of the Stanford University collection). Single, worn valves of this species account for the records of *Semele solida* (Gray) from Tagus Cove, Isla Isabela (PILSBRY & VANATTA, 1902:549) (CAS 064527), and of *S. corrugata* (Sowerby) from Isla Baltra (HERTLEIN & STRONG, 1955a:123) (CAS 064672), Galápagos Islands, Ecuador. These are the only Galápagos records of this generally common species, and it may not be established there. Intertidal zone to 5 m (mean, 2 m), in rubble mixed with sand. It is the most common eastern Pacific *Semele*; I have examined 211 lots.

There are a number of records in Pleistocene strata: Bahía Tortugas (CHACE, 1956:178; EMERSON *et al.*, 1981:110) and Bahía Magdalena (JORDAN, 1936:112; HERTLEIN & STRONG, 1949:243) on the outer coast of Baja California; Isla Carmen and Bahía Santa Inez (HERTLEIN, 1957:63); Isla Coronados (EMERSON & HERTLEIN, 1964:340, 350); and Puerto Peñasco (HERTLEIN & EMERSON, 1956:165) in the Gulf of California. BARKER (1933:89) and HOFFSTETTER (1948:80) recorded it from Pleistocene strata on the Santa Elena Peninsula, Ecuador. RANSON (1959:74) reports it from raised beaches [?Pleistocene] at "Guadalupito," a little north of Chimbote, in either Ancash or La Libertad Prov., Peru, some 600 km south of its present most southerly occurrence. Pliocene records are those of EMERSON & HERTLEIN (1964:341, 350, as "cf.") at Isla Carmen in the Gulf of California and WOODRING *et al.* (1941:opp. p. 78, with question) from the San Joaquin formation in central California. OLSSON (1932:127) reports a specimen that might be allied to *Semele flavescens* in the Miocene of Peru.

**Remarks:** OLSSON (1961:362) incorrectly placed the distinct *Semele californica* in synonymy here.

*Semele (S.) lenticularis* (Sowerby, 1833)

(Figures 12–14)

*Amphidesma lenticulare* Sowerby, 1833: SOWERBY, 1833a:8; pl. 19, fig. 9; SOWERBY, 1833b:200; HANLEY, 1843:44; 7; pl. 12, fig. 49; 1856:341; REEVE, 1853:pl. 6, fig. 39; HANLEY, 1857:pl. 3, fig. 34; TRYON, 1869:121 [*Semele*]; DALL, 1909:272; OLSSON, 1961:359, 363–364, 538, 539; pl. 65, figs. 8, 8a, 8b; pl. 66, fig. 9; KEEN, 1971:251–

252; fig. 636; BERNARD, 1983:46; GEMMELL *et al.*, 1987:14, 56.

*Amphidesma ventricosum* C. B. Adams, 1852: C. B. ADAMS, 1852a:516, 547 [1852b:292, 323]; CARPENTER, 1857b:280, 303 [*Semele*]; CARPENTER, 1864a:367–368 [1872:203–204]; CARPENTER, 1864b:553 [1872:39]; TRYON, 1869:122; LAMY, 1913:330; KEEN, 1958:200–201; fig. 502; OLSSON, 1961:363 [as a synonym of *S. lenticularis*]; TURNER, 1965:97, 130–131; pl. 19, figs. 9, 10; KEEN, 1971:250 [as a synonym of *S. bicolor*].

**Type material and localities:** *A. lenticulare*—BM(NH) 1986075, holotype, pair; length, 22.4 mm; height, 20.9 mm; convexity, 11.1 mm (Figure 12). Santa Elena, Guayas Prov., "W. Col." [Ecuador] (2°11'S, 80°52'W), 11 m, sandy mud; H. Cuming, 1828–1830.

*A. ventricosum*—MCZ 186364, holotype, left valve; length, 15.9 mm; height, 14.9 mm; convexity, 4.5 mm [pair would be about 9 mm] (Figure 13). Panama, presumably from near Panama City (about 8°58'N, 79°32'W); C. B. Adams, 27 Nov. 1850–2 Jan. 1851.

**Description:** Small (to 30.3 mm; Skoglund Coll.; Puerto Lobos, Sonora, Mexico), larger in northern portion of its occurrence; rounded, southern populations proportionately higher; approximately equivalve; shells thin; anterior end longer, rounded; posterior end slightly truncate; antero-dorsal margin slightly concave, with a lunule; postero-dorsal margin straight, with a scarcely evident escutcheon. Periostracum thin, tan. Sculpture of faint concentric and radial threads. White externally, often with reddish flecks or chevrons on dorsal margin; white internally, sometimes with a light yellow suffusion. Pallial sinuses medium in size.

I have illustrated a large, elongate specimen from the Gulf of California (CAS 064539) (Figure 14).

**Distribution and habitat:** Cabo San Lucas, Baja California Sur (22°52'N, 109°53'W) (USNM 3971), into and throughout the Gulf of California, to near El Rubio and Punta Mero, Tumbes Prov., Peru (3°54'S, 80°53'W) (LACM 72-85; SBMNH 34910). Intertidal zone to 44 m (mean, 6 m), probably in rubble with a sandy matrix; on a sand bar (VOKES & VOKES, 1962:61–62). I have examined 140 lots.

**Remarks:** This is a fairly common but poorly understood species, frequently having been mistaken for small *Semele flavescens* (Gould), from which it can be differentiated by its thinner shells and lack of a conspicuous escutcheon. OLSSON (1961) correctly synonymized *Amphidesma ventricosum* with *S. lenticularis*, but not in lumping *S. bicolor* and *A. striosum* here as well. Although OLSSON (1961) labeled one of his figures (pl. 66, fig. 9) as "*Semele lenticulare* . . . (*bicolor*)," this specimen is typical *S. lenticularis* (PRI 25844).

SMITH (1890:301–302) synonymized *Semele lenticularis* with *S. cordiformis* (HOLTEN, 1802:10), a distinct Asian species with heavier shells and stronger radial ribs. No one else has followed this ambitious lumping.

←  
Explanation of Figures 12 to 18

Figures 12–14. *Semele (S.) lenticularis* (Sowerby). Figure 12: Holotype of *Amphidesma lenticulare*; length, 22.4 mm. Figure 13: Holotype of *A. ventricosum* C. B. Adams; length, 15.9 mm. Figure 14: CAS 064539; Puerto Lobos, Sonora, Mexico; length, 30.3 mm.

Figure 15 and 16. *Semele (S.) pilsbryi* Olsson. Figure 15: Holotype of *S. pilsbryi*; length, 45.9 mm. Figure 16: SBMNH 34902; Barra de Navidad, Jalisco, Mexico; length, 40.0 mm.

Figures 17 and 18. *Semele (S.) rubropicta* Dall. Figure 17: Lectotype of *S. rubropicta*; length, 39.9 mm. Figure 18: CAS 064531; Crofton, British Columbia; length, 42.5 mm.

As OLSSON (1961) first suggested, this eastern Pacific species is closest to the type species of *Semele*, *S. proficua* (Pulteney, 1799), which occurs from Beaufort, North Carolina, to the Golfo de San Jorge, Argentina, in the intertidal zone to 55 m (Boss, 1972:8–13). *Semele proficua* is larger, heavier, more rounded, and has heavier sculpture. STANLEY (1970:176–177; pl. 30, figs. 6–9) provided information about the habitat and behavior of *S. proficua*, and FISCHER (1857:335–339; pl. 13, fig. 5) described its anatomy. It is known with certainty from formations as old as the Pliocene in the western Atlantic.

*Semele (S.) pilsbryi* Olsson, 1961

(Figures 15, 16)

*Semele pilsbryi* Olsson, 1961: OLSSON, 1961:360, 368, 538; pl. 65, figs. 6, 6a; KEEN, 1971:253–254; fig. 640; BERNARD, 1983:47.

**Type material and locality:** ANSP 218959, holotype, left valve; length, 45.9 mm; height, 42.4 mm; convexity, 10.0 mm [pair would be about 20 mm] (Figure 15). Bucaro, Azuero Peninsula, Los Santos Prov., Panama (about 7°25'N, 80°10'W).

**Description:** Medium-sized (length to 53.7 mm; LACM 68-41; Bahía Cuastocomate, Jalisco, Mexico); trapezoidal; right valve slightly more inflated; shells average in thickness; much longer, rounded anteriorly; rounded, slightly truncate posteriorly; antero-dorsal margin straight, with a small lunule; postero-dorsal margin straight, with a large escutcheon. Periostracum thin, olive to dark. Sculpture of concentric growth lines and conspicuous radial striae, which are heavier in some specimens than in others. White externally, with reddish flecks along dorsal margin; dark orange within, with purple on ends of hinge. Pallial sinuses medium in size.

I have illustrated here both right and left valves of material from Jalisco, Mexico (SBMNH 34902) (Figure 16).

**Distribution and habitat:** Guaymas, Sonora, Mexico (27°50'N, 110°54'W) (Shy Coll.), to Isla la Plata, Manabi Prov., Ecuador (1°15'S, 81°4'W) (SBMNH 34911). From the intertidal zone to 18 m (mean, 11 m). The only substrate noted on labels is gravel. I have examined only 6 lots, representing 5 stations.

*Semele (S.) rubropicta* Dall, 1871

(Figures 17, 18)

*Semele rubropicta* Dall, 1871: DALL, 1871:144–145, 160; pl. 14, fig. 10; LAMY, 1913:363; DALL, 1915:26; I. OLDROYD, 1924:56, 212; pl. 22, fig. 10; I. OLDROYD, 1925:180; pl. 43, fig. 10; DALL, 1925:26, 37; pl. 18, figs. 1, 2; GRANT & GALE, 1931:376; BURCH, 1945a:17; 1945b:17; 1945c:30; HERTLEIN & GRANT, 1972:300; pl. 48, figs. 1, 2, 7, 11; COAN, 1973:318–319; figs. 4, 15; BERNARD, 1983:47.

*Semele rubrolineata* Conrad, *autt.*, non Conrad, 1837: CARPENTER, 1864b:627 [1872:113].

[non CONRAD, 1837:239; pl. 18, fig. 11—see under *S. decisa*].

*Semele ashleyi* Hertlein & Grant, 1972: HERTLEIN & GRANT, 1972:299–300; pl. 48, figs. 3, 4, 6, 9, 10.

**Type material & localities:** *S. rubropicta*—USNM 101960, lectotype (DALL, 1925:36), left valve; length, 39.9 mm; height, 34.3 mm; convexity, 9.6 mm [pair would be about 19.2 mm] (Figure 17). USNM 678001, paralectotype, right valve; ANSP 51749, possible paralectotype, right valve. Soquel [Capitola], Santa Cruz Co., California (36°53'N, 121°52'W), on beach; W. H. Dall.

*S. ashleyi*—LACM 4789, holotype, pair; length, 40.5 mm; height, 37.0 mm; convexity, 23.6 mm (not figured here). LACM Loc. 305C, “exposure at base of hill, 100'W and 440'S of NE corner of Sec. 8, T.19S., R.2W, USGS topo. map, San Ysidro quad.” (approx. 32°32'30"N, 117°6'W) (LACM 4790–4804, paratypes, LACM Locs. 305, 305C, 318); San Diego Formation; middle Pliocene.

**Description:** Medium-sized (length to 52.0 mm; MCZ 60100; Eagle Island, Puget Sound, Washington); oblong; equivalve; shells average in thickness; much longer, rounded anteriorly; slightly truncate posteriorly; antero-dorsal margin concave near beaks, with a long lunule, rounded anteriorly; postero-dorsal margin rounded, lacking an escutcheon. Periostracum thin, tan to olive. Sculpture of fine concentric ribs in some; heavy, irregular concentric ribs in other material, particularly southern populations; fine radial sculpture also present. Externally white, with reddish rays; white internally. Pallial sinuses large.

I have illustrated a pair from British Columbia (CAS 064531) (Figure 18).

**Distribution and habitat:** Alaska: ?Seldovia Bay, Kenai Peninsula (59°28'N, 151°42'W) (LACM 73-18; two juvenile pairs, perhaps the result of unusual larval settlement); near Sitka, Baranof Island (57°3'N, 135°20'30"W) (Smith Coll., cited by Rae Baxter, in corresp., 13 June 1987); Yamani Cove, Baranof Island (56°40'20"N, 135°10'30"W) (Univ. Alaska Mus. M-759; N. Foster, in corresp., 9 and 27 July 1987); Craig, Prince of Wales Island, Alaska (55°27'N, 133°8'W) (LACM 17-3.1), south to Puget Sound, Washington (approx. 47°30'N, 123°W) (USNM 130631, 184279, and many other lots in various institutions). Not yet reported from the outer coast of Washington or Oregon. Van Damme Beach State Park, Mendocino Co., California (39°18'N, 113°48'W) (LACM 64-8), to Isla Asunción, Pacific coast of Baja California Sur (27°6'N, 114°17'W) (LACM 67-66). In the Gulf of California: near Bahía Willard, Baja California Norte (29°52'30"N, 114°23'30"W) (LACM 69-23), and possibly at Guaymas, Sonora (27°55'N, 110°53'W) (SDNHM 15261). Intertidal zone to 55 m (mean, 19 m), in sandy rubble. I have examined 182 lots.

This species has been recorded from late Pleistocene strata from Cayucos, San Luis Obispo Co., California

(VALENTINE, 1958:690), to Bahía Magdalena, Baja California Sur (JORDAN, 1936:112), with many intermediate records by various authors; in early Pleistocene deposits in the San Pedro area (for example, T. OLDROYD, 1925:7; CLARK, 1931:opp. p. 30), and in the Pliocene of California (for example, WOODRING *et al.*, 1941:33, opp. p. 78; pl. 11, fig. 18; WOODRING & BRAMLETTE, 1951:88; pl. 14, fig. 12; ADEGOKE, 1969:125).

**Discussion:** *Semele ashleyi* Hertlein & Grant, from the middle Pliocene San Diego Formation, was differentiated from *S. rubropicta* by its (1) coarser concentric sculpture, separated by wider, more incised grooves, and (2) less developed lunule. These features are within the range of variability of this species. The average specimens of *S. rubropicta* from southern California and northern Baja California have still coarser sculpture than the type material of *S. ashleyi*. The lunule is indeed minimal on the type material of *S. ashleyi*, but it can be obscure in some Recent specimens as well.

A closely related species is *Semele fausta* Nomland (NOMLAND, 1917:233–236, 248; pl. 9, figs. 3, 3a, 3b) from the Pliocene upper Etchegoin Formation of Fresno Co., California. Its beaks are more pointed and closer to the posterior end, at least in the illustrated type specimen, than in any specimens I have seen of *S. rubropicta*.

*Semele (S.) solida* (Gray, 1828)

(Figures 19, 20)

*Amphidesma solidum* Gray, 1828: GRAY, 1828:6 [the figures cited, "pl. 6, figs. 6, 6a," never published] [as "*A. solida*"]; SOWERBY, 1833a:7; HANLEY, 1843:43; 6; pl. 12, fig. 32; 1856:341; REEVE, 1853:pl. 2, fig. 10; HUPÉ, in Gay, 1854:359; 1858:pl. 7, figs. 1–1c; HANLEY, 1857:pl. 2, fig. 4; PHILIPPI, 1860:175; TRYON, 1869:122 [*Semele*]; LAMY, 1908:52; DALL, 1909:160, 272, 280 [but not p. 294; pl. 28, fig. 10, which is *S. corrugata*]; LAMY, 1913:360–361; DALL, 1915:25; SCHRÖDER, 1916:101–129; figs. 1–13; MARINCOVICH, 1973:14; fig. 21; OSORIO, 1979:32–33; fig. 38; BERNARD, 1983:47.

*Amphidesma rugulosum* Sowerby, in Darwin, 1846: SOWERBY, in Darwin, 1846:38.

*Amphidesma orbicular* Hupé, in Gay, 1854: HUPÉ, in Gay, 1854:359 [in synonymy with *A. solida*]; HUPÉ, in Gay, 1858:pl. 7, figs. 1–1c [as *A. "orbiculare"*]; placed in synonymy by the earlier text].

**Type material and locality:** *A. solidum*—BM(NH) 1986084, lectotype (here designated), pair; length, 50.9 mm; height, 48.5 mm; convexity, 24.6 mm (Figure 19). This specimen is too small to match the length originally given (63.5 mm); it does not closely match the sketch on the unpublished MS plate in the BM(NH), so we must assume that there was more than one original specimen. Arica, Tarapaca Prov., "Peru" [Chile] (18°28'S, 70°20'W); W. Hennah.

*A. rugulosum*—BM(NH) 1987058, lectotype (here designated), right valve; length, 83.1 mm; height, 75.1

mm; convexity, 22.4 mm [pair would be 44.8 mm] (Figure 20). Bahía Herradura [de Guayacan], Coquimbo Prov., Chile (29°58'S, 71°22'W); marine terrace; [middle Pleistocene]; C. Darwin, 14–20 May 1835 (DARWIN, 1962:343–346). BM(NH) 1837.12.1.3673, possible paralectotype, pair. Possibly from the second locality: Coquimbo, Coquimbo Prov., Chile (29°57'S, 71°21'W), on beach; C. Darwin, 14–20 May 1835.

**Description:** Large (Recent material to 80.8 mm; NRS UH Lam. 2283; Isla Quenu, Golfo de Ancud, Llanquihue Prov., Chile); rounded; right valve a little more inflated (decidedly more in a very few); shells heavy; longer anteriorly in most, rounded; slightly truncate posteriorly; antero-dorsal margin concave near beaks, with a lunule, convex anteriorly; postero-dorsal margin slightly convex, with a small escutcheon in left valve. Periostracum light olive to dark, present only as ventral shreds in adult. Sculpture of wavy concentric ribs, which are strong on posterior slope, and few obscure radial ribs. White exteriorly; internally generally white, sometimes with a yellowish tinge; hinge purple at ends; valve margins purple in some. Pallial sinuses large. Anterior lateral in right valve large, produced ventrally.

**Distribution and habitat:** Callao, Lima Prov., Peru (12°3'S, 77°10'W) (USNM 12550, 368501; LACM 35-6), to Pumalin, Golfo de Corcovado, Chiloe Prov., Chile (42°42'S, 72°52'W) (LACM 75-41). Depth records are from the intertidal zone to 11 m (mean, 3 m). The only habitat information available is that given by MARINCOVICH (1973:14): "buried in sand and gravel among boulders in lower intertidal zone." It is of minor commercial importance in Chile (OSORIO, 1979). I have seen 57 lots.

It has been reported from the Archipiélago de los Chonos, Chiloe Prov., Chile (about 45°S) (PHILIPPI, 1860:175; repeated by DALL, 1909:160, and by SOOT-RYEN, 1959:64), but I have not seen any material to confirm this.

SOOT-RYEN'S (1959:63) records of *Semele corrugata* (Sowerby) from 41°3'S to 41°50'S are based on specimens of *S. solida* (NRS).

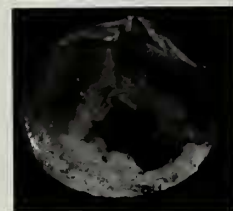
The record of this species from the Galápagos Islands (PILSBRY & VANATTA, 1902:551) was based on a specimen of *Semele flavescens* (Gould) (CAS 064527).

RÜEGG (1957:830) reported this species from Pleistocene strata in Ica Prov., Peru. LAMY (1908:52) and JORDAN (1929:117–118) recorded it as a fossil at Coquimbo, Jordan calling the strata "Pliocene." HERM (1969:120–121; pl. 10, fig. 1) reported this species, as "*Semele corrugata*," from the upper and middle Pleistocene from several localities in Chile, including the deposit at Bahía Herradura, Coquimbo, which he regards as being of middle Pleistocene age.

**Remarks:** The Sowerby MS name, *Amphidesma rugulosum*, was introduced by DARWIN (1846), with a brief description by Sowerby, for fossil and Recent material from



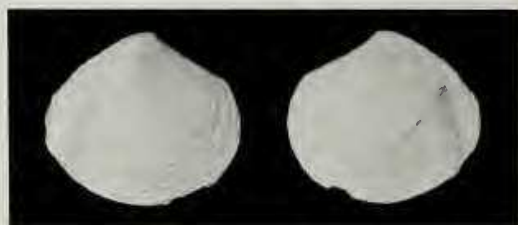
19



20



21



22



23

near Coquimbo, Chile, where *Semele solida* is common and the only *Semele* present, so it could be nothing else. The brief statement comparing Recent and fossil specimens is sufficiently descriptive for the name to be taken as available. As far as I know, aside from reprints of DARWIN (1846), this name has not appeared elsewhere.

*Semele solida* is compared with the closely related *S. corrugata* under the latter. Previously published distributional information about these species is suspect because they have been much confused. In some collections, the concepts of the two were reversed.

*Amphidesma croceum* Gould, 1850, has been synonymized with this species by some authors (for example, DALL, 1909:280), but it belongs under *Semele corrugata*.

In spite of the fact that this species is uncommon in collections in the U.S., it is the best known *Semele* anatomically, owing to the detailed monograph of SCHRÖDER (1916).

*Semele (S.) sowerbyi* Tryon, 1869

(Figure 21)

*Amphidesma punctatum* Sowerby, 1833: SOWERBY, 1833a:8; pl. 18, fig. 7; SOWERBY, 1833b:200; HANLEY, 1843:45; 7; pl. 12, fig. 46; 1856:341; REEVE, 1853:pl. 4, fig. 26; CARPENTER, 1857b:182, 304; HANLEY, 1857:pl. 3, fig. 27; LAMY, 1913:355; 358, footnote; KEEN, 1958:198; OLSSON, 1961:360, 365, 537; pl. 64, fig. 2; KEEN, 1971: 253-254; fig. 642.

[non *Amphidesma punctatum* Say, 1822]: SAY, 1822:308 [as *A. punctata*].

*Semele sowerbyi* Tryon, 1869 [replacement name for *A. punctatum* Sowerby, non Say]: TRYON, 1869:122.

[non *S. sowerbyi* LAMY, 1912:165].

*Semele clydosa* Bernard, 1983 [unnecessary replacement for *A. punctatum* Sowerby, non Say]: BERNARD, 1983:46, 69.

*Amphidesma formosa* Sowerby, auct., non Sowerby, 1833: REEVE, 1841:68; pl. 48, fig. 7.

[non SOWERBY, 1833a:7, 8; pl. 19, fig. 8].

*Semele decisa* (Conrad), auct., non Conrad, 1837: DALL, 1915: 25 [in part].

[non CONRAD, 1837:239; pl. 19, fig. 2].

**Type material and locality:** *A. punctatum* Sowerby—BM(NH) 1986078, **lectotype (here designated)**, the figured syntype, pair; length, 43.9 mm; height, 34.0 mm; convexity, 14.3 mm (Figure 21). BM(NH) 1907.10.28.21,

paralectotype. Galápagos Islands, Ecuador (about 0°30'S, 91°W); H. Cuming, 1828-1830.

**Description:** Medium-sized (to 59.6 mm; UCMP B.3615; Isla Santa Cruz, Galápagos); oblong; right valve slightly more inflated; average in thickness; longer, rounded anteriorly; rounded posteriorly; antero-dorsal margin straight, with a small lunule; postero-dorsal margin slightly rounded, lacking an escutcheon, with a slight flexure to the right. Periostracum thin, tan. Sculpture of heavy concentric ribs that are punctate on the young part of shell; also with finer concentric riblets overriding heavy concentric ribs on the mature part of shell. White externally, with reddish radial rays and small reddish flecks along dorsal margin; white to deep yellow within; hinge slightly purple. Pallial sinuses large.

**Distribution and habitat:** Restricted to the Galápagos Islands: Fernandina (CAS 064529), Isabela (CAS 064528, 064530), Rábida (LACM 71-69), and Santa Cruz (SBMNH 34899, USNM 752921, LACM 66-121, UCMP B.3615, Skoglund Coll.) (approx. 0°15'-1°S, 90°15'-91°45'W). Intertidal zone to 13 m (mean, 6 m); the only bottom type recorded is sand. I have examined 10 lots.

This species has been reported from strata of late Pleistocene age on Isla San Salvador in the Galápagos (HERTLEIN & STRONG, 1939:369).

**Remarks:** As has been mentioned by other authors, this species is closest to the Californian *Semele decisa* (Conrad), from which it differs in being smaller, more elongate, and more punctate.

*Semele (S.) tortuosa* (C. B. Adams, 1852)

(Figures 22, 23)

*Amphidesma tortuosum* C. B. Adams, 1852: C. B. ADAMS, 1852a:515, 547 [1852b:291, 323]; CARPENTER, 1857b: 280, 303 [*Semele*]; CARPENTER, 1864a:367 [1872:203]; TRYON, 1869:122; LAMY, 1913:331, footnote; TURNER, 1956:92-93, 126-127; pl. 17, figs. 10, 11; KEEN, 1958: 200-201; fig. 501; OLSSON, 1961:360, 365, 537; pl. 64, figs. 3-3b; KEEN, 1971:255-256; fig. 650; TAYLOR *et al.*, 1973:266; pl. 5, figs. 1, 2, 4; table 10; BERNARD, 1983: 47.

*Semele planata* Carpenter, 1856: CARPENTER, 1856:160; CARPENTER, 1857b:284, 303; TRYON, 1869:121; LAMY, 1913:331, footnote; KEEN, 1958:198; PALMER, 1963:314, 394; pl. 64, figs. 6-9; KEEN, 1971:255 [as a synonym of *S. tortuosa*].

**Type material and localities:** *A. tortuosum*—MCZ 186366, holotype, pair; length, 30.6 mm; height, 27.3 mm; convexity, 8.0 mm (Figure 22). Panama, presumably near Panama City (about 8°58'N, 79°32'W); C. B. Adams, 27 Nov. 1850-2 Jan. 1851.

*S. planata*—BM(NH) 1986078, holotype, pair; length, 39.9 mm; height, 35.0 mm; convexity, 11.6 mm (Figure 23). Panama Bay; T. Bridges, spring 1856.

Explanation of Figures 19 to 23

Figures 19 and 20. *Semele (S.) solida* (Gray). Figure 19: **Lectotype** (herein) of *Amphidesma solidum*; length, 50.9 mm. Figure 20: **Lectotype** (herein) of *A. rugulosum* Sowerby; length, 83.1 mm.

Figure 21. *Semele (S.) sowerbyi* Tryon. **Lectotype** (herein) of *Amphidesma punctatum* Sowerby (non Say); length, 43.9 mm.

Figures 22 and 23. *Semele (S.) tortuosa* (C. B. Adams). Figure 22: Holotype of *Amphidesma tortuosum*; length, 30.6 mm. Figure 23: Holotype of *S. planata* Carpenter; length, 39.9 mm.

**Description:** Medium-sized (length to 56.2 mm; McClincy Coll.; Bahía San Carlos, Sonora, Mexico); rounded; not as convex as other species; right valve more inflated; shells average in thickness; longer, produced, rounded anteriorly; truncate and conspicuously flexed posteriorly, right valve with a pronounced, broad radial rib at edge of posterior slope, left valve with a corresponding conspicuous furrow; antero-dorsal margin relatively straight to slightly concave, with a broad, elongate lunule; postero-dorsal margin straight, with a broad escutcheon. Periostracum thin, tan. Sculpture of well-spaced, heavy, wavy, concentric ribs. White externally, with reddish flecks along dorsal margin; white to orange-yellow within; hinge with a purple stain at anterior end of beaks. Pallial sinuses medium in size.

The shell structure of this uncommon species was discussed by TAYLOR *et al.* (1973).

**Distribution and habitat:** Bahía San Carlos, Sonora, Mexico (27°56'N, 111°4'W) (CAS 064716; SBMNH 34898), to Puerto Palmar, Guayas Prov., Ecuador (2°2'S, 80°44'W) (OLSSON, 1961). I have not seen specimens from further south than Panama Bay, but there is little reason to doubt Olsson's record. Records are from the intertidal zone to 55 m (mean, 21 m), on sand and rocky substrates. It is uncommon; I have examined only 17 lots.

(*Amphidesma*) Lamarck, 1818

(*Amphidesma*) LAMARCK, 1818:489–493.

**Type species:** *A. variegata* LAMARCK, 1818:490; by subsequent designation of CHILDREN, 1823:300–301; = *Tellina purpurascens* GMELIN, 1791:3288; western Atlantic and eastern Pacific.

Like the preceding subgenus, *Semele*, *s.s.*, this may be polyphyletic, but it is used here to provide a convenient grouping for some eastern Pacific species. In general, these species are thinner-shelled than *Semele*, more elongate, and tend to have discrepant sculpture (that is, the sculpture in the two valves differs). In general, they occur farther offshore than species of *Semele* and more often on soft bottoms, mud, or sand.

This subgenus was occasionally incorrectly used in the Mesodesmatidae.

*Semele* (*A.*) *craneana* Hertlein & Strong, 1949

(Figures 24, 25)

*Semele craneana* Hertlein & Strong, 1949: HERTLEIN & STRONG, 1949:240–242, 258; pl. 1, figs. 19, 22; KEEN, 1958:196–197; fig. 479; OLSSON, 1961:360, 539; pl. 66, fig. 2 [not in main text]; KEEN, 1971:249–250; fig. 628; BERNARD, 1983:46.

**Type material and locality:** CAS 064521 (*ex* CASGTC 9249), holotype, left valve; length, 37.9 mm; height, 29.0 mm; convexity, 6.2 mm [pair would be about 12.4 mm] (Figure 24). Southern Gulf of California; exact locality unknown; type locality here restricted to **Arena Bank**, Baja California Sur (23°27'N, 109°24'W), where HERT-

LEIN & STRONG (1949) reported the species from two stations, yielding specimens that are regarded as paratypes: CAS 064497 (*ex* SUPTC 8056), from Loc. 136-D-24; CAS 064534 (*ex* CAS 17714) (Figure 25) and AMNH 160337 from Loc. 136-D-26.

**Description:** Medium-sized (length to 42.0 mm; Skoglund Coll.; N of Isla Danzante, Baja California Sur); oblong; equivalve; shells thin to average in thickness; longer, sharply rounded anteriorly; decidedly truncate posteriorly; antero-dorsal margin almost straight, with a narrow lunule; postero-dorsal margin straight, with an indistinct escutcheon. Periostracum light tan. Sculpture of heavy, rounded concentric ribs, some of which are oblique near posterior end. White to yellowish externally, rayed and blotched with red, purple, and/or tan; these colors showing through into interior. Pallial sinuses large.

**Distribution and habitat:** Baja California Norte: Roca Consag (31°7'N, 114°29'W) (LACM 37-122). Baja California Sur: N of Isla Danzante (Skoglund Coll.); NW end of Isla Smith (Skoglund Coll.); Arena Bank (see **Type material**), Isla Cerralvo (MCZ 253664), Los Frailes (Skoglund Coll.), and 5.6 km off Roca Piramide, Isla Clarion, Islas Revillagigedos (18°19'N, 114°45'W) (CAS 064533). Sonora: Punta San Antonio (27°57'N, 111°7'W) (Skoglund Coll.). Depth records are from 32 to 110 m (mean, 78 m), on mud and sand substrates. I know of only 11 lots.

**Remarks:** HERTLEIN & STRONG (1949) compared their new species to two taxa unrelated to it—the eastern Pacific *Semele tabogensis* Pilsbry & Lowe, here regarded as a synonym of *S. rosea* (Sowerby), and the western Atlantic *S. martini* (Reeve, 1853), regarded as a synonym of the African *S. modesta* (Reeve, 1853) by BOSS (1972:13–14). The closest ally is probably *S. (A.) purpurascens* (Gmelin), which is discussed below and differs in lacking heavy concentric ribs as an adult. Juvenile *S. craneana*, however, are smooth and not unlike *S. purpurascens*, differing in being flatter.

*Semele* (*A.*) *formosa* (Sowerby, 1833)

(Figures 26–28)

*Amphidesma formosum* Sowerby, 1833: SOWERBY, 1833a:7, 8; pl. 19, fig. 8; SOWERBY, 1833b:199; HANLEY, 1843: 44; 7; pl. 12, fig. 48; 1856:341; REEVE, 1853:pl. 4, fig. 27; HANLEY, 1857:pl. 3, fig. 25; TRYON, 1869:120 [*Sem-*

#### Explanation of Figures 24 to 28

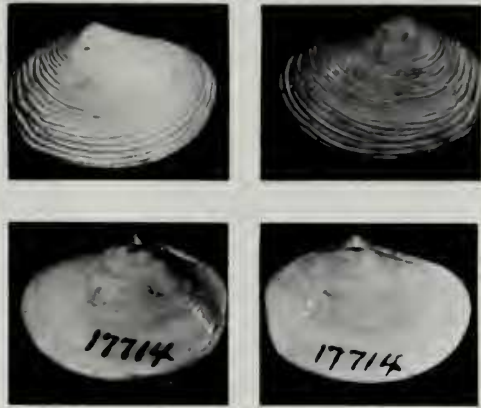
Figures 24 and 25. *Semele* (*Amphidesma*) *craneana* Hertlein & Strong. Figure 24: Holotype of *S. craneana*; length, 37.9 mm. Figure 25: CAS 064534; paratype of *S. craneana*; length, 26.0 mm.

Figures 26–28. *Semele* (*A.*) *formosa* (Sowerby). Figure 26: Lectotype of *Amphidesma formosum*; length, 50.6 mm. Figure 27: Holotype of *S. verruculastra* Keen; length, 42.6 mm. Figure 28: LACM 72-63; Isla del Caño, Costa Rica; length, 55.3 mm.





24



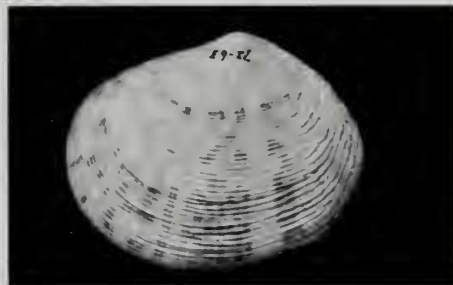
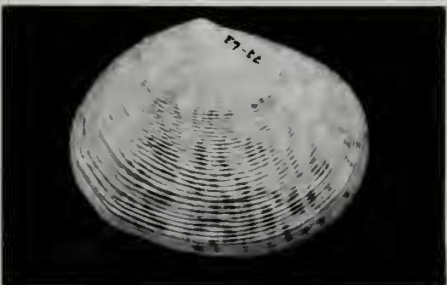
25



26



27



28

ele]; VERRILL, 1870:218–219; DALL, 1909:271; LAMY, 1913:355; DALL, 1915:26; HERTLEIN & STRONG, 1949:240, 249; KEEN, 1958:196–197; fig. 482; OLSSON, 1961:360, 365, 558; pl. 85, fig. 8; KEEN, 1971:251–252; fig. 631; COAN, 1983:133–134; figs. 1, 2; BERNARD, 1983:46.

[but not REEVE, 1841:68; pl. 48, fig. 7; = *A. punctata* Sowerby].

*Semele verrucosa* Mörch, *auctt.*, non Mörch, 1860: HERTLEIN & STRONG, 1949:240, 249, 258; pl. 1, figs. 21, 24; KEEN, 1958:202–203; fig. 504; OLSSON, 1961:360, 366, 538; pl. 65, figs. 1–1b; EMERSON & HERTLEIN, 1964:356, 357; 359–360; figs. 3i, j.

[non Mörch, 1860:190–191].

*Semele verruculastra* Keen, 1966: KEEN, 1966b:32–33; KEEN, 1971:255–257; fig. 653; COAN, 1983:133–134 [as a synonym of *S. formosa*]; BERNARD, 1983:47.

**Type material and localities:** *A. formosum*—BM(NH) 1907.10.28.20, lectotype (COAN, 1983:133), right valve, the specimen in Sowerby's uppermost figure; length, 50.6 mm; height, 40.9 mm; convexity, 9.8 mm [pair would be about 19.6 mm] (Figure 26). Bahía Santa Elena, Guayas Prov., Ecuador (2°12'S, 80°52'W), 13 m; H. Cuming, 1828–1830. (The pair figured by Olsson, 1961, as "holotype" could not have been from the original lot because "only two odd valves" were originally collected.)

*S. verruculastra*—CAS 036679 [ex CASGTC 9256], holotype, right valve; length, 42.6 mm; height, 32.5 mm; convexity, 6.5 mm [pair would be about 13.0 mm] (Figure 27). Hannibal Bank, Panama (7°23'30"N, 80°3'W), about 68 m; CAS Loc. 17996.

**Description:** Medium-sized (length to 77.0 mm; Kerstitch Coll.; Bahía Bocochibampo, Sonora, Mexico); oblong; equi-valve; average in thickness; longer, rounded anteriorly; somewhat truncate, flexed to the left posteriorly; antero-dorsal margin fairly straight, with a narrow elongate lunule; postero-dorsal margin slightly rounded, without an escutcheon. Periostracum not evident. Sculpture of regular concentric ribs that are frilly at anterior and posterior ends of valves, and broken into alternating imbrications near center of right valve and in dorsal area of left valve; fine radial striae present. Externally with radial brown lines that are generally broken into patches; beaks with a V-shaped white patch; white to yellow-orange within, with the external brown patches showing through; hinge purple. Pallial sinuses large.

Because the type specimens are both right valves, I have illustrated a pair from Costa Rica (LACM 72-63) (Figure 28).

**Distribution and habitat:** Isla San Pedro Mártir (28°22'N, 112°21'W) (CAS 064889) and Bahía San Carlos, Sonora (27°56'N, 111°4'W) (SBMNH 34913; Skoglund Coll.), and Isla San Marcos, Baja California Sur (27°12'N, 112°5'W) (CAS 064535; UCMP R.7103), Mexico, to Bahía Santa Elena, Guayas Prov., Ecuador (2°12'S, 80°52'W) (type loc.); Isla del Coco, Costa Rica (CAS 051865). I have not seen any specimens other than the type material

from further south than the Archipiélago de las Perlas, Panama (Skoglund Coll.; and OLSSON, 1961, as "*S. verrucosa*"), but there is little reason to doubt the type locality. Depth records are from 1.5 to 68 m (mean, 22 m), on sand. I have examined 32 lots.

A record from Puertecitos (DUSHANE, 1962:49), further north in the Gulf of California, cannot be verified and was probably based on a misidentification.

HOFFSTETTER (1948:80) reported this species, with some doubt, from Pleistocene strata on Ecuador's Santa Elena Peninsula.

### *Semele (A.) pallida* (Sowerby, 1833)

(Figures 29–31)

*Amphidesma pallidum* Sowerby, 1833: SOWERBY, 1833a:7, 8; pl. 17, fig. 3; SOWERBY, 1833b:199; REEVE, 1841:67; pl. 47, fig. 3; HANLEY, 1843:44; 7; pl. 12, fig. 44; 1856:341; REEVE, 1853:pl. 4, fig. 22; HANLEY, 1857:pl. 3, fig. 32; TRYON, 1869:121 [*Semele*]; DALL, 1909:272; LAMY, 1913:354, footnote; OLSSON, 1961:360, 364, 539; pl. 66, fig. 8; KEEN, 1971:253–254; fig. 638; BERNARD, 1983:47.

*Semele regularis* Dall, 1915, non Smith, 1885: DALL, 1915:27.

[non SMITH, 1885:87; pl. 5, figs. 4–4b, an Australian *Abra*].

*Semele simplicissima* Pilsbry & Lowe, 1932: PILSBRY & LOWE, 1932:93, 144; pl. 12, figs. 6, 6a; HERTLEIN & STRONG, 1949:240, 247; KEEN, 1958:200–201; fig. 497; OLSSON, 1961:364 [as a synonym of *S. pallida*]; KEEN, 1971:254–255; fig. 647; BERNARD, 1983:47; HERTZ, 1986:41.

*Semele paziana* Hertlein & Strong, 1949 [new name for *S. regularis* Dall, non Smith]: HERTLEIN & STRONG, 1949:240; 247, incl. footnote; KEEN, 1958:198–199; fig. 490; OLSSON, 1961:364 [as a synonym of *S. pallida*]; PARKER, 1964a:161; pl. 5, fig. 22; PARKER, 1964b:pl. 5, fig. 22; KEEN, 1971:253–254; fig. 639; BERNARD, 1983:47.

**Type material and localities:** *A. pallidum*—BM(NH) 1986077/1, lectotype (here designated), the figured syn-type, pair; length, 30.6 mm; height, 22.8 mm; convexity, 11.8 mm (Figure 29). BM(NH) 1986077/1, 2, paralectotypes. [Isla] Salango, Manabi Prov., Ecuador (1°35'S, 80°52'W), 13 m, sandy mud; H. Cuming, 1828–1830.

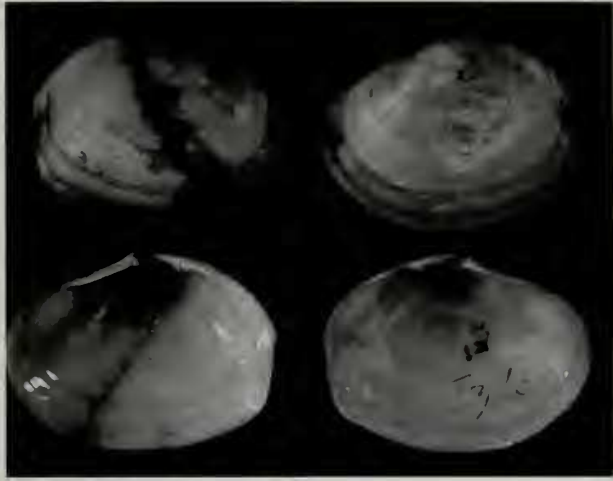
*S. regularis* Dall/*S. paziana*—USNM 96433, lectotype (here designated), right valve; length, 21.0 mm; height, 16.0 mm; convexity, 3.6 mm (Figure 30). USNM 859082, paralectotype, 1 valve. Off La Paz, Baja California Sur,

→

### Explanation of Figures 29 to 34

Figures 29–31. *Semele (A.) pallida* (Sowerby). Figure 29: Lectotype (herein) of *Amphidesma pallidum*; length, 30.6 mm. Figure 30: Lectotype (herein) of *S. regularis* Dall (non Smith); length, 21.0 mm. Figure 31: Holotype of *S. simplicissima* Pilsbry & Lowe; length, 19.9 mm.

Figures 32–34. *Semele (A.) purpurascens* (Gmelin). Figure 32: Type figure from LISTER (1687); length, 32 mm. Figure 33: Lectotype (herein) of *S. sparsilineata* Dall; length, 14.6 mm. Figure 34: LACM 34-146; Bahía Tenacatita, Jalisco, Mexico; length, 20.9 mm.



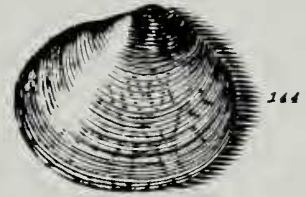
29



30



31



144. *pectunculus tenuis*, or *viola purpurascens*,  
*radiatus*.

32



33



34

Mexico, *Albatross* stn. 2823 (24°18'N, 110°22'W), sand [label] or broken shell [log], 48 m; 30 April 1888.

*S. simplicissima*—ANSP 155014, holotype, pair; length, 19.9 mm; height, 14.8 mm; convexity, 7.6 mm (Figure 31). Acapulco, Guerrero, Mexico (16°51'N, 99°56'W), 37 m; H. N. Lowe, April 1930.

**Description:** Medium-sized (length to 41.1 mm; SBMNH 34914; Empalme, Sonora, Mexico); oblong; equivalve; thin-shelled; longer, sharply rounded anteriorly; truncate posteriorly; antero-dorsal margin concave near beaks, with a lunule, straight to convex anteriorly; postero-dorsal margin slightly convex, with an escutcheon. Periostracum with an iridescent sheen, present only as ventral shreds in many adult specimens. Sculpture of fine, closely spaced concentric ribs that are half as numerous on posterior slope. White externally and internally, but often with pink or orange hue near beaks and internally. Pallial sinuses medium in size.

**Distribution and habitat:** Gulf of California as far north as Bahía San Carlos, Sonora (27°56'N, 111°4'W) (CAS 064542, 064543), and Bahía Concepción, Baja California Sur (25°10'N, 111°55'W) (CAS 064544), to Tumbes, Tumbes Prov., Peru (3°31'S, 80°25'W) (LACM 72-83). From 13 to 128 m (mean, 45 m), on sand and mud. I have examined 62 lots.

**Discussion:** OLSSON (1961) was correct in synonymizing *Semele paziana* and *S. simplicissima* with *S. pallida*. DALL (1915) did not compare his *S. regularis* (*non* Smith; later renamed *S. paziana*) with *S. pallida*, nor did PILSBRY & LOWE (1932) compare their *S. simplicissima* with *S. pallida*. The supposed distinction in the presence or absence of concentric striae between concentric ribs that some authors have advanced proves not to be useful.

*Semele (A.) purpurascens* (Gmelin, 1791)

(Figures 32–34)

*Venus purpurascens* Gmelin, 1791: GMELIN, 1791:3288 [spelled *V. pupurascens*], in Rudolphipoli printing; DALL, 1900:993 [*Semele*]; LAMY, 1913:350–353; BOSS, 1972:7, 13, 15–20, 24; pl. 3; pl. 5, fig. D; pl. 6, figs. A–D; pl. 7, fig. E; pl. 8, fig. D; pl. 10, fig. C.

*Tellina obliqua* Wood, 1815: WOOD, 1815:152; pl. 41, figs. 4, 5 [name suppressed, ICZN Opinion 948, 29 March 1971]; CARPENTER, 1857b:284, 303 [*Semele*].

*Amphidesma variegata* Lamarck, 1818: LAMARCK, 1818:490 [based, in part, on LAMARCK, 1798:pl. 291, fig. 3]; HUPÉ, in Gay, 1854:359–360; 1858:pl. 7, fig. 2; DALL, 1909:272 [*Semele*]; LAMY, 1913:353.

*Semele sparsilineata* Dall, 1915: DALL, 1915:26; HERTLEIN & STRONG, 1949:240, 247–248, 258; pl. 1, fig. 8; KEEN, 1958:200–201; fig. 498; OLSSON, 1961:359, 363, 539; pl. 66, fig. 7; CAUQUOIN, 1969:577; KEEN, 1971:255–256; fig. 649.

[Not to be confused with *Amphidesma purpurascens* Sowerby, 1833 (renamed *Semele sowerbyi* Tryon, 1869), see above;

nor with *A. purpurascens* LAMARCK, 1818:493, a synonym of *Evilia nitens* (Montagu, 1808), according to LAMY (1912:165; 1913:328–329).]

**Type material and localities:** I have not searched for the type material of two of the three non-eastern Pacific synonyms.

*V. purpurascens*—One of LISTER's figures (1687:pl. 303, fig. 144), one of three illustrations cited by Gmelin, was designated as the type figure by BOSS (1972:17); length, 33 mm; height, 27.8 mm (Figure 32). Lister's collection is supposedly at Cambridge University, but none of his material has yet been recognized there (DANCE, 1986:217). BOSS (1972:15) designated Key West, Florida, as the type locality.

*T. obliqua*—Not searched. BOSS (1972:16) also designated Key West, Florida, as the type locality of this synonym.

*A. variegata*—Muséum d'Histoire Naturelle, Geneva 1082/74/1, 2, syntypes, pairs; no. 1 is 43 mm in length; no. 2 is 40 mm in length. Although Lamarck indicated the origin of his material as "les côtes d'Afrique," the large pallial sinuses on these specimens suggest that they came from the western Atlantic, fortunate because BOSS (1972:16) designated Key West, Florida, as the type locality of this synonym. (The closely related west African species, *Semele lamyi* Nicklès, 1955, has conspicuously smaller pallial sinuses.)

*S. sparsilineata*—USNM 96269, lectotype (here designated), left valve; length, 14.6 mm; height, 11.0 mm; convexity, 3.6 mm [pair would be about 7.2 mm] (Figure 32). USNM 859083, paralectotypes, 4 valves. Panama Bay, Panama, *Albatross* stn. 2798 (8°10'30"N, 78°50'30"W), 33 m, sand; 5 March 1888.

**Description:** Small (length to 33.5 mm; ANSP 308233; Isla Taboga, Panama); oblong; equivalve; shells thin; longer, rounded anteriorly; somewhat truncate posteriorly; antero-dorsal margin straight, with a narrow lunule; postero-dorsal margin straight, with an indistinct escutcheon in left valve. Periostracum thin, tan. Sculpture of fine concentric threads that are especially oblique in left valve, running ventrally toward posterior end. Color white to orange externally and internally, with purple suffusion in many and brown flecks and rays; brown patterns generally showing through into interior. Pallial sinuses large.

I am illustrating an eastern Pacific pair from central Mexico in better condition than the type of *Semele sparsilineata* (LACM 34-146) (Figure 34).

The animal was figured by HUPÉ, in Gay (1858:pl. 7; fig. 2b), and the anatomy was discussed by BOSS (1972:4–7; pl. 3).

**Distribution and habitat:** Gulf of California at Bahía San Carlos, Sonora (27°56'N, 111°5'W) (LACM 64-36), but with no specimens from elsewhere in the Gulf of California, south to Punta Ancon, Guayas Prov., Ecuador (2°20'S, 80°54'W) (SBMNH 34916); Isla del Coco, Costa

Rica (SBMNH 34915, 34940); Isla Isabela, Galápagos Islands, Ecuador (LACM 66-211). HUPÉ (in Gay, 1854) reported it from Peru and Chile. A Peruvian occurrence is plausible in that Hupé figured an animal. GIGOUX (1935: 284) also reported this species from Chile in Atacama Prov. There are no specimens in collections I have studied from either Peru or Chile. Records in the eastern Pacific are from the intertidal zone to 78 m (mean, 19 m), on rubble substrates. I have seen 56 eastern Pacific lots.

In the western Atlantic, BOSS (1972) reports it from Cape Fear, North Carolina, to Río de la Plata, Uruguay, from "shallow water" to 640 m on sand bottoms. It also occurs in formations of Miocene, Pliocene, and Pleistocene ages in the western Atlantic region. This species appears to be more common in the western Atlantic than it is in the eastern Pacific.

**Discussion:** The distinctions that workers have cited between *Semele purpurascens* from the western Atlantic and *S. sparsilineata* from the eastern Pacific are the latter's less-pronounced oblique grooving (DALL, 1915) and the belief that it is smaller, heavier, and less convex (OLSSON, 1961). However, the extent of grooving is variable (see BOSS, 1972:pl. 6, figs. A-D). The largest eastern Pacific specimen I have seen is 33.5 mm in length, only 2.5 mm less than the largest specimen that Boss cites from the western Atlantic, 36 mm. I measured five adult specimens from Key West, Florida (CAS 064545), and found a convexity-length ratio of 0.38 ( $\pm 0.03$ ) and a convexity-height ratio of 0.47 ( $\pm 0.03$ ). Five specimens of similar size from Esmeraldas, Ecuador (SBMNH 34901), had a convexity-length ratio of 0.41 ( $\pm 0.02$ ) and a convexity-height ratio of 0.49 ( $\pm 0.02$ ). Thus, some eastern Pacific material is as convex, if not more convex, than western Atlantic material. I have also found that shell thickness varies a great deal, perhaps depending on environmental conditions.

The name *Semele lamyi* Nicklès, 1955 (NICKLÈS, 1955: 202-204; fig. 32), was proposed for west African material based on differences in the pallial line, cardinal teeth, color, and sculpture. The last three characters are suspect, being variable in western Atlantic and eastern Pacific material of *S. purpurascens*, but the pallial sinus of the specimen figured by Nicklès is conspicuously smaller than any specimen I have seen of *S. purpurascens*.

*Semele (A.) venusta* (Reeve, 1853, ex A. Adams MS)

(Figures 35-37)

*Amphidesma venustum* Reeve, 1853, ex A. Adams MS: REEVE, 1853:pl. 1, fig. 3 [as "A. Adams"]; A. ADAMS, 1854:96 [*Semele*]; CARPENTER, 1857b:245, 303; 1864b:537, 668 [1872:23, 154]; TRYON, 1869:122; LAMY, 1913:356; DALL, 1915:27; HERTLEIN & STRONG, 1949:240, 248-249, 258; pl. 1, fig. 13; KEEN, 1958:200, 202-203; fig. 503; OLSSON, 1961:360, 370, 539; pl. 66, figs. 1, 1a; CAUQUOIN, 1969:577; KEEN, 1971:255-256; fig. 651; BERNARD, 1983:47.

*Semele incongrua* Carpenter, 1864: CARPENTER, 1864b:611, 640 [1872:97, 126]; CARPENTER, 1865:208-1866:209 [as *S. "incungrua"*]; TRYON, 1869:120; LAMY, 1913:354, footnote; DALL, 1915:27; I. OLDROYD, 1925:181; pl. 11, figs. 12, 13; GRANT & GALE, 1931:377; BURCH, 1945a: 18; 1945b:17; HERTLEIN & STRONG, 1949:240, 249; PALMER, 1958:16, 27, 38, 48, 110-111, 339; pl. 14, figs. 7-10; COAN, 1973:320-322; figs. 6, 7, 17; BERNARD, 1983:46.

*Semele pulchra* "var." *montereyi* Arnold, 1903: ARNOLD, 1903: 166-167, 392; pl. 15, figs. 3, 3a [not 4, 4a, as stated in text and in pl. expl.]; DALL, 1915:27 [as a synonym of *S. incongrua*]; GRANT & GALE, 1931:377; BURCH, 1945a: 18; HERTLEIN & STRONG, 1949:249 [as a subspecies of *S. incongrua*].

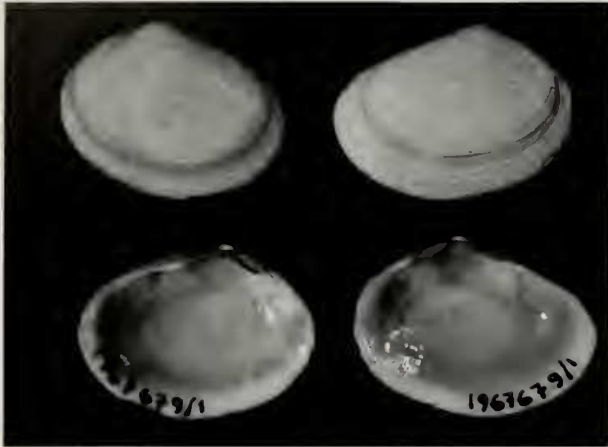
**Type material and localities:** *A. venustum*—BM(NH) 1967679/1, lectotope (here designated), the figured specimen, pair; length, 29.0 mm; height, 21.6 mm; convexity, 11.1 mm (Figure 35). BM(NH) 1967679/2, paralectotype. "West Colombia" [probably Ecuador]; H. Cuming, 1828-1830. I here restrict the type locality to Manta, Manabi Prov., Ecuador (0°57'N, 80°44'W), from where OLSSON (1961) reported the species.

*S. incongrua*—USNM 663888, lectotype (COAN, 1973: 320), pair; length, 14.1 mm; height, 10.0 mm; convexity, 4.7 mm (Figure 36). Catalina Island, Los Angeles Co., California (about 33°26'N, 118°29'W); 73-110 m; J. G. Cooper, 20-26 June 1863.

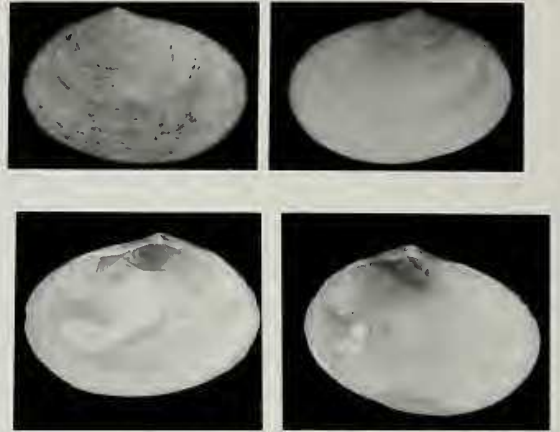
*S. pulchra montereyi*—USNM 162526, holotype, right valve; length, 18.7 mm; height, 15.0 mm; convexity, 3.8 mm [pair would be about 7.6 mm] (Figure 37). Deadman Island, San Pedro, Los Angeles Co., California (33°13'N, 118°1'W); lower San Pedro Formation, early Pleistocene; R. Arnold. (This island is no longer present in Los Angeles Harbor.)

**Description:** Small (length to 27.8 mm; LACM 39-97; Santa Rosa Island, California); ovate-ellipsoid; equivalve; shells thin; much longer, obliquely rounded anteriorly; rounded posteriorly; antero-dorsal margin slightly concave near beaks, with a lunule, convex anteriorly; postero-dorsal margin slightly convex, with an indistinct escutcheon in left valve. Periostracum not evident. Sculpture of concentric ribs, those in left valve smooth and rounded, except on posterior slope, those in right valve sharper, more lamellar, often scaly on posterior slope. Fine radial sculpture generally present between concentric ribs in both valves. Externally white, rayed with brown or purple, often with a lighter radial band in center of umbones, with flecks of purple on dorsal margin; internally purple or rose. Pallial sinuses very large.

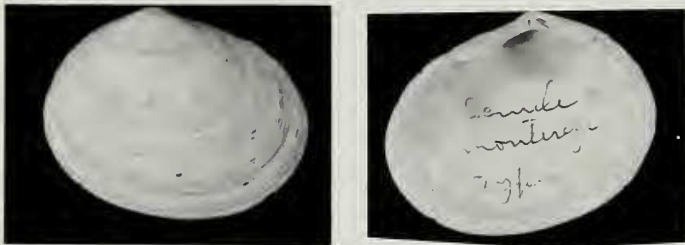
**Distribution:** Monterey, Monterey Co., California (36°38'45"N, 121°56'W) (USNM 20438, 56330, 194332, 194335; LACM 124470, 38-157; UCMP E.8331; CAS 064554, 064557), into the Gulf of California as far north as Isla Smith (about 29°3'N, 113°13'W) (CAS 064546) and Isla Angel de la Guarda (about 29°3'N, 113°30'W)



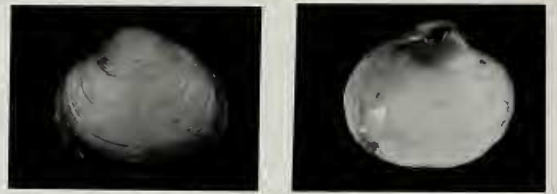
35



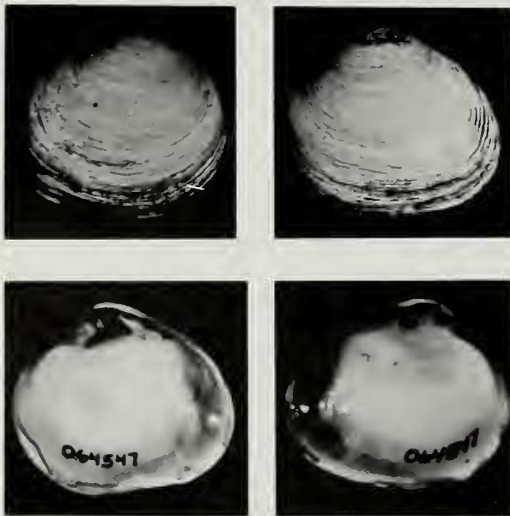
36



37



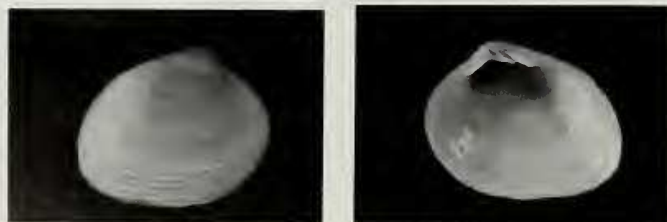
38



39



40



41

(SBMNH 34918), Baja California Norte, but not yet found in the eastern Gulf, to Punta Picos, Tumbes Prov., Peru (3°45'S, 80°47'W) (OLSSON, 1961); Galápagos Islands, Ecuador: Fernandina (LACM 72-196), Isabela (LACM 34-199), San Salvador (LACM 34-56), and Santa Fé (LACM 71-79). From 10 to 183 m (mean, 49 m), on sand, mud, and rock bottoms, most often the first two. I have examined 192 lots.

This species has been reported from late Pleistocene (BRUFF, 1946:233) and early Pleistocene (ARNOLD, 1903; CLARK, 1931:opp. p. 30; VALENTINE & MEADE, 1961:20) strata in southern California.

**Remarks:** HERTLEIN & STRONG (1949:200, 248-249) differentiated *Semele venusta* from *S. incongrua* on the basis of the former's (1) thicker shell, (2) coarser sculpture ventrally, and (3) attenuated pallial sinus. In addition, I had earlier thought that *S. venusta* was (1) larger, (2) had more prominent beaks, (3) was smoother, with more rounded concentric sculpture, and (4) had darker colors (COAN, 1973:320-321).

After careful study of more abundant material, none of these supposed distinguishing characters holds up. Thick-shelled specimens occur in southern California, and thin-shelled specimens have been obtained from the Gulf of California and the Galápagos Islands. Many of the previously available specimens from southern Mexico and Central America were beachworn and were therefore fairly smooth with rounded sculpture. The pallial sinus criterion does not hold up at all. The largest specimen recorded is from southern California, and the beaks of Panamic specimens are no more prominent than those of some Californian material. Whereas Panamic material is often more colorful, very colorful specimens have also been collected in southern California.

A similar western Atlantic species is *Semele casali* Doello-Jurado, 1949 (DOELLO-JURADO, 1949:1-4, 8; pl. 1, figs. 1, 2; text fig. 1), which occurs from Surinam to Argentina (Boss, 1972:23-26). It differs in being thicker and in lacking the fine radial sculpture of *S. venusta*.

(*Elegantula*) de Gregorio, 1884

(*Elegantula*) DE GREGORIO, 1884:137.

**Type species:** *Semele fazisa* DE GREGORIO, 1884:137-138; by monotypy; = *Amphidesma striata* Reeve, 1853, ex Ruppell MS: pl. 7, fig. 46. East Africa and the Red Sea; ?Mediterranean.

This rare species is discussed by LAMY (1913:365-367; pl. 8, figs. 10-12). I have examined only one specimen, a pair from Madagascar, which was, like the type of *Semele fazisa*, collected from a sponge (USNM 719226). The two eastern Pacific species of this subgenus, which nestle in cracks in rock and coral, are often irregular in outline, and have proportionately large hinges.

*Semele (E.) rupicola* Dall, 1915

(Figures 38, 39)

*Semele rupicola* Dall, 1915: DALL, 1915:26; I. OLDROYD, 1925:180; pl. 11, figs. 9, 10; BURCH, 1945a:17; 1945b:17; KEEN, 1958:200-201; fig. 495; COAN, 1973:319-320; figs. 5, 16; BERNARD, 1983:47.

*Semele rupium* (Sowerby), *auct.*, non (Sowerby, 1833): CARPENTER, 1864b:611, 640, 684 [1872:97, 126, 170]; WILLIAMSON, 1892:186; DALL, 1909:272 [in part].

[non *Amphidesma rupium* SOWERBY, 1833a:7, 8; pl. 19, figs. 10, 10\*—see below].

*Semele striosa* C. B. Adams, *auct.*, non (C. B. Adams, 1852): DALL, 1915:25-26 [in part]; I. OLDROYD, 1925:179 [in part; not pl. 9, fig. 3, which is a specimen of *S. flavescens*]; BURCH, 1945a:17; 1945b:17; 1945c:30; KANAKOFF & EMERSON, 1959:24.

[non *Amphidesma striosum* C. B. ADAMS, 1852a:515—see under *Semele pulchra*].

**Type material and locality:** *S. rupicola*—USNM 272099, lectotype (COAN, 1973:319), left valve; length, 22.0 mm; height, 17.0 mm; convexity, 4.1 mm [pair would be about 8.2 mm] (Figure 38). USNM 663892, paralectotype. Santa Barbara, Santa Barbara Co., California (34°24'N, 119°43'W); W. H. Dall.

**Description:** Medium-sized (to 71.4 mm; Evans Coll., cited by DRAPER, 1987:38; Laguna Beach, Orange Co., California); trapezoidal but often irregular in outline from nestling habitat; equivalve; average in thickness; irregularly rounded anteriorly; generally longer, somewhat truncate posteriorly; antero-dorsal margin rounded, with a lunule; postero-dorsal margin straight, with a scarcely evident escutcheon. Periostracum thin, tan. Sculpture of irregular, often wavy concentric ribs and fine radial striae. Externally white; internally generally stained rose to orange on hinge and around valve margins. Pallial sinuses small. Hinge teeth large.

I have illustrated a pair from San Diego, California, that is more characteristic than the type specimen (CAS 064547) (Figure 39).

**Distribution:** Southeast Farallon Island, San Francisco Co., California (37°4'N, 123°W) (LACM 62-9; CAS

#### Explanation of Figures 35 to 41

Figures 35-37. *Semele (A.) venusta* (Reeve). Figure 35: **Lectotype** (herein) of *Amphidesma venustum*; length, 29.0 mm. Figure 36: Lectotype of *S. incongrua* Carpenter; length, 14.1 mm. Figure 37: Holotype of *S. pulchra montereyi* Arnold; length, 18.7 mm.

Figures 38 and 39. *Semele (Elegantula) rupicola* Dall. Figure 38: Lectotype of *S. rupicola*; length, 22.0 mm. Figure 39: CAS 064547; San Diego, California; length, 39.0 mm.

Figures 40 and 41. *Semele (E.) rupium* (Sowerby). Figure 40: **Lectotype** (herein) of *Amphidesma rupium*; length, 26.0 mm. Figure 41: Holotype of *S. floreanensis* Soot-Ryen; length, 22.0 mm.

064548), to Punta Entrada, Bahía Magdalena, Baja California Sur (24°32'24"N, 112°4'W) (LACM 71-14). Material labeled as having come from "Cabo San Lucas" (USNM 663893) may be accurate or may represent a labeling error; this record has not been verified in recent years. However, material labeled "Gulf of California" (USNM 130322) probably represents an error. Depth records are from the intertidal zone to 83 m (mean, 15 m). This species lives in rubble, and it can nestle in such rocky sites as empty pholad holes. I have examined 165 lots.

Californian fossil records are from late Pleistocene strata at Cayucos (VALENTINE, 1958:690), Newport Bay (KANAKOFF & EMERSON (1959, as *S. "striosa"*), and Point Loma (WEBB, 1937:345); and early Pleistocene strata at San Pedro (VALENTINE & MEADE, 1961:17).

**Remarks:** Young specimens have a regular shape, regular radial sculpture, and no color. Such material accounts for California records of *Semele striosa* (C. B. Adams).

*Semele (E.) rupium* (Sowerby, 1833)

(Figures 40, 41)

*Amphidesma rupium* Sowerby, 1833: SOWERBY, 1833a:7, 8; pl. 19, figs. 10, 10\*; SOWERBY, 1833b:199; HANLEY, 1843:44; 7; pl. 12, fig. 50; 1856:341; REEVE, 1853:pl. 2, fig. 9; CARPENTER, 1857b:182, 304, 359; HANLEY, 1857:pl. 3, figs. 30, 31; TRYON, 1869:122 [*Semele*] [in part]; DALL, 1909:272 [in part]; LAMY, 1913:364 [in part]; DALL, 1915:26; SOOT-RYEN, 1932:314; KEEN, 1958:200-201; fig. 496; KEEN, 1971:254-255; fig. 646; BERNARD, 1983:47.

*Semele floreanensis* Soot-Ryen, 1932: SOOT-RYEN, 1932:314, 316, 322, 324; pl. 2, figs. 11, 12; CAUQUOIN, 1969:575; KEEN, 1971:255 [as a synonym of *S. rupium*].

**Type material and localities:** *A. rupium*—BM(NH) 1986083/1, lectotype (here designated), the pair illustrated by SOWERBY (1833a) in his fig. 10\*; length, 26.0 mm; height, 22.5 mm; convexity, 11.3 mm (Figure 40). BM(NH) 1986083/2, 3, paralectotypes; BM(NH) 1986082/1, paralectotype, the pair illustrated by Sowerby in his figure 10; BM(NH) 1986082/2, 3, additional paralectotypes. I have selected the specimen of Sowerby's "var." because it, and the two paralectotypes in the same lot, are unambiguously associated with the Galápagos Islands (about 0°30'S, 91°W), from "clefts of rocks in coarse gravel"; H. Cuming, 1828-1830. The other specimens look conspecific and probably also came from there, but they were cited as coming from "coarse gravel in the crevices in rocks in coral reefs at Lord Hood's Island." Although there is a Hood Island in the Galápagos [now called Española], there is evidence that Cuming did not visit it (Darwin, as quoted by DANCE, 1986:115), and Cuming twice visited Lord Hood's Island [now called South Marutea] in the Tuamotu Archipelago, where he stayed quite a while (DANCE, 1986:112).

*S. floreanensis*—Zoologisk Museum, Oslo, Norway 41/

10 (31891), holotype, right valve; length, 22.0 mm; height, 17.4 mm; convexity, 4.9 mm [pair would be about 9.8 mm] (Figure 41). Zoologisk Museum, paratype, left valve. Isla Santa María, Galápagos Islands, Ecuador (1°16'S, 90°31'W); A. Wollebaek, 1924-1925.

**Description:** Small (to 30.7 mm; LACM 38-66; Isla Onslow, Galápagos); trapezoidal, but often irregular in shape due to nestling habitat; equivalve; average in thickness; irregularly rounded to produced anteriorly; longer, somewhat truncate posteriorly; antero-dorsal margin straight to concave, with a lunule; postero-dorsal margin straight, without an escutcheon. Periostracum thin, tan. Sculpture of irregular, sharp concentric ribs, which can be lamellar on posterior margin, and radial threads. White externally, often with red rays; white internally, sometimes with purplish stain posteriorly and on hinge. Pallial sinuses small. Hinge proportionately large.

**Remarks:** This species differs from *Semele rupicola* in having a more quadrate outline, with more anterior beaks, a thinner shell, more regular sculpture, being more brightly colored, and in having a less projecting resillifer.

**Distribution and habitat:** Galápagos Islands: Baltra (CAUQUOIN, 1969), Bartolomé (SBMNH 34920), Fernandina (LACM 66-125), Isabela (CAS 064558), Onslow (LACM 38-66), Plazas (UCMP B.3603), San Cristóbal (ANSP 153334), San Salvador (LACM 34-52; UCMP B.3621, B.3625), Santa Cruz (SBMNH 34900, 34919; CAS 064549, 064551; UCMP B.3618; USNM 752918), and Santa María (TOMLIN, 1928:197; SOOT-RYEN, 1932:314, and type location of *Semele floreanensis*); and Isla del Coco, Costa Rica (SBMNH 34937 and several other lots). From 1 to 73 m (mean, 17 m), on coral rubble substrates. I have examined 31 lots.

DALL (1909:272) reported this species from Guayaquil, Ecuador, but there are no specimens in collections to support this.

HERTLEIN & STRONG (1939:369) report this species from late Pleistocene strata on Isla San Salvador.

**Remarks:** SOOT-RYEN (1932) does not compare his new *Semele floreanensis* with *S. rupium*, which he also reports from Isla Santa María. *Semele floreanensis* is merely a young specimen that is regular in shape.

There is no evidence that members of this subgenus occur in the Indo-Pacific province between east Africa and the Galápagos Islands. *Semele crenata* A. ADAMS & ANGAS, 1864:426, described from Moreton Bay, Queensland, Australia, was compared to *S. rupium* and was said to differ in having crenate concentric ribs. However, it is now regarded as a synonym of *S. crenulata* (REEVE, ex Sowerby MS, 1853:pl. 2, fig. 8), a very dissimilar species with more evenly rounded shells. I have seen a specimen of this species from the type locality of *S. crenata* (Australian Mus. C-76966).



(*Semele*), *s.l.*

Group of *Semele barbarae* (Boone)

This New World lineage was diverse in the Tertiary of the Caribbean but now survives only in the eastern Pacific. The stem may be *Semele chipolana* Dall, 1900 (DALL, 1900: 986–987, 1193; pl. 37, fig. 3) from the early Miocene Chipola Formation of Florida, as first concluded by GARDNER (1928:203). This species is perhaps closest to the Recent eastern Pacific *S. jovis* (Reeve), but it is thinner, more elongate, and more equilateral. *Semele claytoni* Maury, 1917 (MAURY, 1917:391–392, 413; pl. 35, fig. 9) of the late Miocene Cercado Formation of the Dominican Republic and *S. claytoni couvensis* Maury, 1925 (MAURY, 1925:270–271; pl. 21, fig. 4) of the late Miocene of Trinidad may represent the ancestors of the Recent eastern Pacific *S. barbarae* (Boone) and the Plio-Pleistocene western Atlantic *S. perlamellosa* Heilprin, 1887.

Another branch of this lineage leads to *Semele leana* Dall of the late Pliocene Caloosahatchee Formation of Florida, which I regard as a synonym of the Recent eastern Pacific *Semele rosea* (Sowerby) (see under same).

*Semele barbarae* (Boone, 1928)

(Figures 42–44)

*Tellina barbarae* Boone, 1928: BOONE, 1928:9; pl. 1, upper fig.; HERTLEIN & STRONG, 1949:244 [as a synonym of *S. jovis*]; KEEN, 1958:196 [as a possible synonym of *S. jovis*]; KEEN, 1971:251 [as a possible synonym of *S. jovis*]; BERNARD, 1983:46 [as a synonym of *S. jovis*].

*Amphidesma purpurascens* Sowerby, 1833, non (Gmelin, 1791), non Lamarck, 1818: SOWERBY, 1833a:8; pl. 18, fig. 5; SOWERBY, 1833b:199–200; REEVE, 1841:68; pl. 48, fig. 5; HANLEY, 1843:44; 7; pl. 12, fig. 45; 1856:341; REEVE, 1853:pl. 6, fig. 37; HANLEY, 1857:pl. 3, figs. 28, 29; TRYON, 1869:121 [*Semele*]; DALL, 1909:272.

[non *Venus purpurascens* Gmelin, 1791, a *Semele* (see above)].  
[non *Amphidesma purpurascens* LAMARCK, 1818:493, which has been synonymized by most authors with *Ervilia nitens* (Montagu, 1808)].

*Semele sowerbyi* Lamy, 1912, new name for *Amphidesma purpurascens* Sowerby, 1833, non (Gmelin, 1791), non Lamarck, 1818; non *Semele sowerbyi* Tryon, 1869: LAMY, 1912:165, footnote; LAMY, 1913:328, 352, footnotes; HERTLEIN & STRONG, 1949:248, footnote; OLSSON, 1961:360, 367, 538; pl. 65, figs. 7, 7a; CAUQUOIN, 1969:577; KEEN, 1971:255–256; fig. 648; BERNARD, 1983:47.

[non *Semele sowerbyi* TRYON, 1869:122; see under it].

**Type material and localities:** *T. barbarae*—Original lost or mislaid during transfer of the Bingham Oceanographic Collection to the Peabody Museum of Natural History at Yale University, probably never to be found (W. O. Hartman, in correspondence, 15 May 1986). The original specimen measured approximately 36 mm in length and 27 mm in height (Figure 42). Archipiélago de las Perlas, Panama, 22 m; H. P. Bingham, 31 March–2 April 1926.

USNM 588133, **neotype (here designated)**, pair; length, 47.4 mm; height, 36.3 mm; convexity, 13.0 mm (Figure 43). Isla San José, Archipiélago de las Perlas, Panama (about 8°15'N, 79°5'W), beach drift; J. P. E. Morrison, 15 March 1944.

*A. purpurascens* Sowerby—BM(NH) 1986080, holotype, left valve; length, 48.5 mm; height, 37.3 mm; convexity, 7.8 mm [pair would be about 15.6 mm] (Figure 44). Santa Elena, Guayas Prov., “W. Col.” [Ecuador] (2°12'S, 80°52'W), on beach; H. Cuming, 1828–1830.

**Description:** Medium-sized (to 48.5 mm; holotype of *Amphidesma purpurascens* Sowerby); elongate; equivalve, compressed; shells thin for size; approximately equilateral; rounded anteriorly; produced, truncate posteriorly (some specimens more rounded); antero-dorsal margin straight, with a narrow lunule; postero-dorsal margin straight, with an escutcheon. Periostracum thin, brown. Sculpture of thin, closely spaced concentric ribs that lean dorsally throughout the surface (less so than in *Semele jovis*), sometimes broken into frills. Color purple throughout, with a long, narrow white radial ray from the beaks; purple within; hinge white. Pallial sinuses medium in size.

**Distribution and habitat:** Bahía Isla Grande, Guerrero, Mexico (17°40'N, 101°39'W) (LACM 124463; SBMNH 34921), to Playas, Guayas Prov., Ecuador (2°39'S, 80°23'W) (Skoglund Coll.). Depths from 27 to 101 m (mean, 54 m). No substrates recorded. Uncommon; I have examined only 11 lots.

HOFFSTETTER (1952: 41) reports this species as a “subfossil” on the Santa Elena Peninsula, Ecuador.

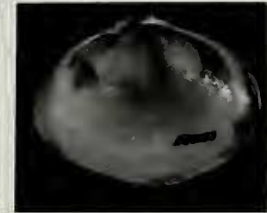
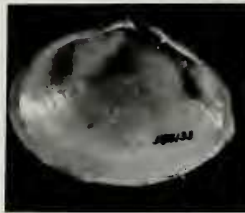
**Remarks:** Before I realized that *Semele sowerbyi* Lamy, 1912, was a junior homonym of *S. sowerbyi* Tryon, 1869, I debated somewhat inconclusively whether to synonymize *Tellina barbarae* Boone, with the former or with *S. jovis* (Reeve). Boone's type is lost; the description lacks critical details; and the figure could depict either species. It was not important to resolve the question because it would have been a synonym in either case.

The arguments in favor of its placement with *Semele jovis* were its rounded outline, Boone's description of it as being rosy purple, and its somewhat expanded antero-dorsal margin. On the other hand, *S. jovis* is not yet known from south of Costa Rica; the specimens reported as *S. jovis* from the Archipiélago de las Perlas by HERTLEIN & STRONG (1955b:201–202) are instead the present species (AMNH 73613). Moreover, rare specimens of the present species may be rounded, as, for example, that illustrated by OLSSON (1961:pl. 65, figs. 7, 7a), which I recently verified (PRI 25835). Now, with the pressing need for a substitute for the junior homonym *S. sowerbyi* Lamy, it is important to establish the identity of *Tellina barbarae*, which I do here by means of a neotype designation.

*Semele barbarae* (as *S. sowerbyi* Lamy) was compared by OLSSON (1961) to *S. perlamellosa* Heilprin (HEILPRIN, 1887:



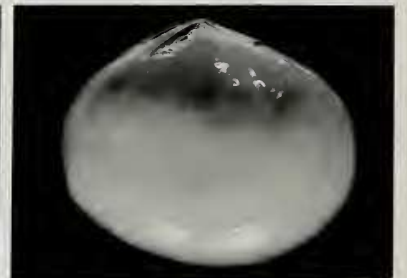
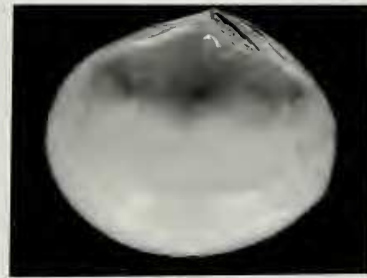
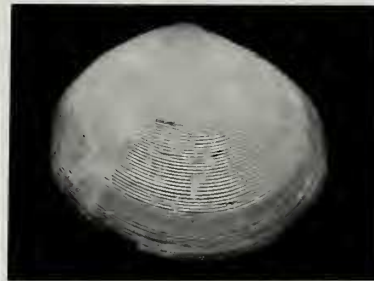
42



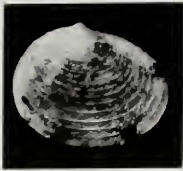
43



44



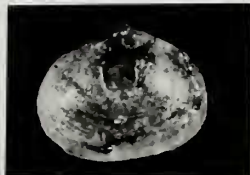
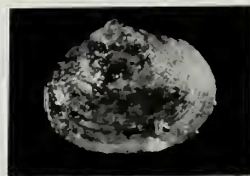
45



46



47



48



50



49

92, 102; pl. 2, fig. 23) from late Pliocene and early Pleistocene strata in Florida. The latter is more elongate, with heavier sculpture of more widely spaced concentric ribs. Its posterior end is more broadly set off, and it attains a much larger size (88.7 mm in one specimen I examined; TU Loc. 726).

*Semele jovis* (Reeve, 1853, ex A. Adams MS)

(Figures 45, 46)

*Amphidesma jovis* Reeve, 1853, ex A. Adams MS: REEVE, 1853:pl. 5, fig. 34 [as "A. Adams"]; A. ADAMS, 1854: 94 [*Semele*]; TRYON, 1869:120; LAMY, 1913:357, footnote; DALL, 1915:26; HERTLEIN & STRONG, 1949:240, 244-245; KEEN, 1958:196-197; fig. 485; OLSSON, 1961: 360, 367-368, 539, 558; pl. 66, fig. 12; pl. 85, figs. 7, 7a; KEEN, 1971:251-252; fig. 633; pl. 8, fig. 5; BERNARD, 1983:46; GEMMELL *et al.*, 1987:55-56.

?*Tellina lamellata* Carpenter, 1857: CARPENTER, 1857b:245 [*nomen nudum*]; CARPENTER, 1857c:37; KEEN, 1958:168-169; fig. 388; KEEN, 1968:394-395, 400; figs. 20a, b [as *Semele* sp.]; KEEN, 1971:250 [as *Semele* sp.]; BERNARD, 1983:46 [as a synonym of *S. jovis*].

**Type material and localities:** *A. jovis*—BM(NH) 1986071, holotype, pair; length, 58.3 mm; height, 48.9 mm; convexity, 22.9 mm (Figure 45). Original locality unknown. HERTLEIN & STRONG (1949:244) designated Puerto Parker, Guanacaste Prov., Costa Rica (10°56'N, 85°48'W), as the type locality.

*T. lamellata*—BM(NH) 1857.6.4.121, lectotype (here designated), pair; length, 3.3 mm; height, 2.5 mm; convexity, 0.76 mm (Figure 46). Paralectotypes, two valves on the same slide. Mazatlán, Sinaloa, Mexico (23°12'N, 106°24'W); "nestling on *Chama* and *Spondylus*"; F. Reigen, 1848-1850.

**Description:** Medium-sized (length to 71.4 mm; SDNHM 31223; La Paz, Baja California Sur, Mexico); rounded; inflated, left valve somewhat more so; shells average in thickness; longer, rounded anteriorly; slightly truncate posteriorly; antero-dorsal margin convex, concave near beaks,

with a narrow, elongate lunule; postero-dorsal margin convex, with an elongate escutcheon. Periostracum thin, tan. Sculpture of regular, thin concentric ribs that lean dorsally. Color light pink externally, with a narrow white rib radiating a short distance from beaks, bracketed with broad, reddish brown areas (rare all-white specimens have been collected); white to pink internally; hinge white. Pallial sinuses medium in size.

An external view of a living animal was given by KEEN (1971:pl. 8, fig. 5).

**Distribution and habitat:** Bahía Adair, Sonora, Mexico (31°30'N, 113°37'W) (LACM 124459), throughout the Gulf of California, to Bahía Ballena, Puntarenas Prov., Costa Rica (9°44'12"N, 84°59'32"W) (LACM 72-45). Intertidal zone to 55 m (mean, 21 m), on sand and perhaps mud. I have examined 46 lots.

**Remarks:** The type material of *Tellina lamellata* consists of one tiny closed pair and two still smaller valves, all glued to a glass slide. KEEN (1968) concluded from one of the open valves that they were juvenile *Semele*. The material has since been removed and reglued, and the hinge details are not clearly visible. However, the sculpture and shape are not unlike juvenile *Semele*. I have compared these specimens with the few juvenile specimens available for study of several species of *Semele* and conclude that this placement is the most likely. Unfortunately, there are no other available specimens of *S. jovis* as small as these.

*Semele jovis* is very close to *S. barbarae*. It differs in its generally more oval outline; thicker shell; less produced and truncate posterior end; less frilly concentric sculpture; rosy rather than purple color; and shorter, broader white band radiating from the beaks.

*Semele rosea* (Sowerby, 1833)

(Figures 47-50)

*Amphidesma roseum* Sowerby, 1833: SOWERBY, 1833a:7, 8; pl. 17, fig. 1; SOWERBY, 1833b:199; REEVE, 1841:67; pl. 47, fig. 1; HANLEY, 1843:44; 7; pl. 12, fig. 35; 1856:341; REEVE, 1853:pl. 3, fig. 17; HANLEY, 1857:pl. 3, fig. 26; TRYON, 1869:119 [*Semele*; as a synonym of *S. decisa*]; DALL, 1909:272; LAMY, 1913:356-357; HERTLEIN & STRONG, 1949:244-245; OLSSON, 1961:360, 366-367, 537; pl. 64, fig. 8; CAUQUOIN, 1969:576-577; KEEN, 1971:253-255; fig. 644, 645; BERNARD, 1983:47.

?*Tellina regularis* Carpenter, 1857: CARPENTER, 1857b:245 [*nomen nudum*]; CARPENTER, 1857c:36-37; KEEN, 1958: 177 [*nomen dubium*]; BRANN, 1966:13, 32; pl. 7, fig. 57; KEEN, 1968:394, 395, 400; fig. 21 [juv. *Semele*]; KEEN, 1971:250 [juv. *Semele*].

*Semele junonia* Verrill, 1870: VERRILL, 1870:217-218; LAMY, 1913:356-357 [as a variety of *S. rosea*]; DALL, 1915:26; KEEN, 1958:198; pl. 4; CAUQUOIN, 1969:576 [as a possible synonym of *S. rosea*]; KEEN, 1971:251-252; fig. 634; pl. 4; BERNARD, 1983:46.

*Semele leana* Dall, 1900: DALL, 1892:211 [*nomen nudum*]; DALL, 1900:992, 1193; pl. 37, figs. 1, 2.

*Semele tabogensis* Pilsbry & Lowe, 1932: PILSBRY & LOWE, 1932:91-92, 144; pl. 12, figs. 5, 5a, 5b; HERTLEIN &

Explanation of Figures 42 to 50

Figures 42-44. *Semele barbarae* (Boone). Figure 42: Original figure of *Tellina barbarae*; specimen length, 36 mm. Figure 43: Neotype (herein) of *T. barbarae*; length, 47.4 mm. Figure 44: Holotype of *Amphidesma purpurascens* (Sowerby) (*non* (Gmelin); *non* Lamarck); length, 48.5 mm.

Figures 45 and 46. *Semele jovis* (Reeve). Figure 45: Holotype of *Amphidesma jovis*; length, 58.3 mm. Figure 46: Lectotype (herein) of *Tellina lamellata* Carpenter; length, 3.3 mm.

Figures 47-50. *Semele rosea* (Sowerby). Figure 47: Specimen figured by REEVE (1853) from type lot; length, 64.8 mm. Figure 48: Lectotype (herein) of *Tellina regularis* Carpenter; length, 1.8 mm. Figure 49: Lectotype (herein) of *S. junonia* Verrill; length, 64.6 mm. Figure 50: Holotype of *S. tabogensis* Pilsbry & Lowe; length, 36.8 mm.

STRONG, 1949:240, 248; KEEN, 1958:200–201; fig. 500; OLSSON, 1961:360, 366–367, 537; pl. 64, fig. 7 [as a subspecies of *S. rosea*; vice versa on p. 537]; CAUQUOIN, 1969:576 [as a synonym of *S. rosea*]; KEEN, 1971:254–255; fig. 645 [as a subspecies of *S. rosea*]; BERNARD, 1983:47 [as a synonym of *S. rosea*]; HERTZ, 1986:41.

**Type material and localities:** *A. roseum*—Sowerby's holotype, a left valve, is missing. It measured 63.2 mm in length, 58.4 mm in height; his measurement of 27.9 mm in convexity would presumably have represented a pair. I here illustrate BM(NH) 1986081/1, the pair figured by REEVE (1853), apparently from the type lot; length, 64.8 mm; height, 55.6 mm; convexity, 26.9 mm (Figure 47). Tumbes, Tumbes Prov., Peru (3°29'S, 80°23'W); H. Cuming, 1828–1830.

*T. regularis*—BM(NH) 1857.6.4.120, **lectotype (here designated)**, the intact right valve glued on the slide; length, 1.8 mm; height, 1.5 mm; thickness, 0.35 mm [very hard to measure; pair would be about 0.7 mm] (Figure 48). Paralectotype, broken left valve on the same slide, possibly mate to right valve. Mazatlán, Sinaloa, Mexico (23°12'N, 106°24'W); "from *Spondylus* washings"; F. Reigen, 1848–1850.

*S. junonia*—Peabody Museum 4080, **lectotype (here designated)**, pair; length 64.6 mm; height, 56.0 mm; convexity, 27.8 mm (Figure 49). Near La Paz, Baja California Sur (about 24°10'N, 110°19'W); from pearl divers by J. Pederson. This was one of six original pairs. Only one other valve, now a paralectotype, remains in the collection.

*S. leana*—USNM 155790, 8 syntypes (1 pair, 7 valves) (not figured here). Caloosahatchie Formation at Caloosahatchie River and Shell Creek, Florida; late Pliocene.

*S. tabogensis*—ANSP 155012, holotype, right valve; length, 36.8 mm; height, 29.6 mm; convexity, 5.0 mm [pair would be about 10.0 mm] (Figure 50). SDMNH 50770, paratypes, 3 valves. Isla Taboga, Panama (about 8°47'N, 79°34'W); "among rocks near the bathing beach"; H. N. Lowe, 1931.

**Description:** Large (length to 84.8 mm; Swoboda Coll.; Bahía San Carlos, Sonora); rounded; left valve more inflated; average in thickness; longer, rounded anteriorly; truncate posteriorly; antero-dorsal margin convex, with a lunule; right valve with anterior and posterior dorsal flanges that overlap left valve; postero-dorsal margin convex, with a narrow escutcheon. Periostracum thick, dark brown, shiny. Sculpture of narrow concentric ribs that lean dorsally, more numerous in right valve. Externally pink to orange, darker at beaks; pink within. Pallial sinuses medium in size.

**Distribution and habitat:** Northern entrance of Bahía Magdalena, Baja California Sur (24°32'N, 112°4'W) (LACM 71-14), into the Gulf of California as far north as Bahía de los Angeles, Baja California Norte (28°55'N, 113°31'W) (SBMNH 34924), and Bahía San Carlos, Sonora (27°56'N, 111°4'W) (LACM 64-36; Skoglund Coll.; Poorman Coll.), Mexico, southward to Tumbes, Tumbes

Prov., Peru (3°29'S, 80°23'W) (type locality). Other than a lot labeled "Peru" (ANSP 51760), the most southerly station from which I have seen material is Playas, Guayas Prov., Ecuador (Skoglund Coll.). Depth records are from the intertidal zone to 113 m (mean, 23 m). Substrates are indicated for only 4 lots: 3 sand and 1 rocky. I have examined 40 lots.

HOFFSTETTER (1948:80) noted this species from Pleistocene strata on the Santa Elena Peninsula, Ecuador.

**Remarks:** Carpenter's *Tellina regularis*, like his *T. lamellata*, was based on juvenile specimens of *Semele* (and should never have been given a name). The lack of comparative material of equivalent size prevents definite placement, but it seems to come closest to young *S. rosea*, which occurs at Mazatlán (SDNHM 84561).

VERRILL (1870) differentiated *Semele junonia* from *S. rosea* on the grounds that it was more orbicular and had more concentric ribs. The lectotype of *S. junonia* has virtually the same length-height ratio (1.15) as does the Reeve specimen from the original lot of *S. rosea* (1.17), and Sowerby's original specimen was even slightly higher for its length (1.09). Both Sowerby's and Reeve's figures depict left valves, which have fewer concentric ribs than right valves. KEEN (1971:251–252, 253–255) lists the two as separate taxa but without differentiating characters.

*Semele leana* Dall, from the late Pliocene Caloosahatchie Formation of Florida, proves to be identical to *S. rosea*. It shows the same range of variability as Recent material—some elongate anteriorly, some more rounded; some with a narrowly restricted posterior slope, some with a more broadly defined area (based on study of TU material).

PILSBRY & LOWE (1932) did not list any characters to separate their *Semele tabogensis* from *S. rosea*. OLSSON (1961) made the two subspecies, listing both from Venado Beach, Panama. (In his text, *S. tabogensis* is a subspecies of *S. rosea*; in his plate explanation, it was reversed.) He says that *S. r. tabogensis* is more subovate, its posterior end longer, and its color more uniform, characters well within the range of variability of *S. rosea*.

#### Group of *Semele guaymasensis*

Small, with conspicuous radial sculpture at least on ends of valves, evidently occurring on sand bottoms, mostly offshore.

#### *Semele guaymasensis* Pilsbry & Lowe, 1932

(Figures 51, 52)

*Semele guaymasensis* Pilsbry & Lowe, 1932: PILSBRY & LOWE, 1932:92, 144; pl. 12, figs. 8, 9; HERTLEIN & STRONG, 1949:240, 243–244; KEEN, 1958:196–197; fig. 483; OLSSON, 1961:361, 369 [in part], 538; pl. 65, fig. 4 [539; pl. 66, fig. 6; =*S. verrucosa* Mörch]; KEEN, 1971:251–252; fig. 632; COAN, 1973:325; GEMMELL *et al.*, 1980: 35; fig. 15; BERNARD, 1983:46; HERTZ, 1986:38; GEMMELL *et al.*, 1987:55.

**Type material and locality:** ANSP 155011, lectotype (here designated), right valve; length, 15.9 mm; height, 12.3 mm; convexity, 2.3 mm (Figure 51). ANSP 361643, paralectotype, left valve; length, 16.1 mm; height, 12.0 mm; convexity, 2.7 mm (Figure 52). PILSBRY & LOWE (1932) said that only unpaired valves were collected, but they illustrated as the "type" two opposite valves of similar size from different individuals. SDNHM 50772, paratypes, 3 valves. Guaymas, Sonora, Mexico (27°55'N, 110°53'W); 37 m; H. N. Lowe, Jan. 1930.

**Description:** Small (length to 27.8 mm; CAS 064675; Estero Soldado, Sonora, Mexico); oblong; equivalve; shells average in thickness; longer, sharply rounded anteriorly; somewhat truncate posteriorly; antero-dorsal margin straight, with a lunule; postero-dorsal margin straight, with an escutcheon, largest in left valve. Periostracum very thin, tan. Sculpture of concentric ribs that form a carina along escutcheon in many specimens. Anterior slope with 4–6 heavy radial ribs in each valve. Externally whitish, with flecks or rays of purple; dorsal margin with purplish blotches; white internally, with purple patches in some specimens; hinge purple. Pallial sinuses large.

**Distribution and habitat:** From La Paz, Baja California Sur (24°10'N, 110°19'W) (USNM 555455, and several other lots; LACM 66-30; CAS 064550, 064552, 064555), northward throughout the Gulf of California to its head at Puerto Peñasco, Sonora (about 31°20'N, 113°40'W) (SBMNH 34922, 34923; UCMP E.8323; CAS 064553; ANSP 164508), and south to Bahía Chamela, Jalisco, Mexico (19°32'N, 105°6'W) (LACM 127520). From the intertidal zone to 110 m (mean, 16 m), on sand and mud; intertidal zone on sand bars (GEMMELL *et al.*, 1987:55). I have examined 136 lots.

Records of this species from Panama (STRONG & HERTLEIN, 1939:184; OLSSON, 1961:369, 539; pl. 66, fig. 6) were based on specimens of *Semele verrucosa* Mörch. A single lot labeled "Redondo Beach," California (MCZ 105544), is undoubtedly the result of mixing in shipment.

This species has been reported from Pleistocene formations at Bahía Magdalena, Baja California Sur (JORDAN, 1936:112, 145–146), and at Puerto Peñasco, Sonora (HERTLEIN & EMERSON, 1956:165).

**Remarks:** As pointed out by HERTLEIN & STRONG (1949:244), this species is close to *Semele anteriocosta* Vokes (VOKES, 1938:13–15; fig. 5) from strata of late Miocene age on Trinidad; JUNG (1969:398–399, 611; pl. 36, figs. 4–9) reports "*S. aff. anteriocosta*" from an early Pliocene formation on that island.

### *Semele pulchra* (Sowerby, 1832)

(Figures 53–55)

*Amphidesma pulchrum* Sowerby, in Broderip & Sowerby, 1832: SOWERBY, in Broderip & Sowerby, 1832:57; SOWERBY, 1833a:7, 8; pl. 17, figs. 2, 2\*; REEVE, 1841:

67; pl. 47, figs. 2, 2\*; HANLEY, 1843:45; 6; pl. 12, fig. 6; 1856:341; C. B. ADAMS, 1852a:514–515 [1852b:290–291]; REEVE, 1853:pl. 1, fig. 2; CARPENTER, 1857b:188, 280, 303 [*Semele*]; HANLEY, 1857:pl. 3, figs. 23, 24; CARPENTER, 1864a:367 [1872:203]; CARPENTER, 1864b:537, 553, 592, 611, 640, 668 [1872:23, 39, 78, 97, 126, 154]; TRYON, 1869:121; ARNOLD, 1903:166, 392; pl. 15, figs. 1, 1a; DALL, 1909:272; LAMY, 1913:353–354; DALL, 1915:27; I. OLDROYD, 1925:181; GRANT & GALE, 1931:377; BURCH, 1945a:18; 1945b:17; HERTLEIN & STRONG, 1949:240, 258; pl. 1, fig. 15; KEEN, 1958:198–199; fig. 492; OLSSON, 1961:361, 368–369, 538; pl. 65, fig. 5; KEEN, 1971:253–254; fig. 641; COAN, 1973:321–323; figs. 8–11, 18; BERNARD, 1983:47.

*Amphidesma striosum* C. B. Adams, 1852: C. B. ADAMS, 1852a:515, 547 [1852b:291, 323]; CARPENTER, 1857b:280, 303 [*Semele*]; CARPENTER, 1864a:367 [1872:203] [similar to *S. pulchra*]; CARPENTER, 1864b:553 [1872:39]; TRYON, 1869:122; LAMY, 1913:354, 365, footnotes; I. OLDROYD, 1925:179 [in part]; not pl. 9, fig. 3 [= *S. flavescens*]; TURNER, 1956:90, 128–129; pl. 18, figs. 1, 2; KEEN, 1958:200–201; fig. 499; OLSSON, 1961:363–364 [as a synonym of *S. lenticularis*]; KEEN, 1971:250 [as a synonym of *S. bicolor*].

[Not to be confused with *Semele striata* (Reeve, 1853), type species of *Elegantula*; see above.]

?*Mesodesma rubrotincta* Gould, 1857, ex "Sowerby" MS [nomen nudum; probably a misspelling of *Amphidesma rubrolineatum* Conrad, but non Conrad, 1837 (see under *S. decisa*)]; GOULD, 1857:330; CARPENTER, 1864b:592 [1872:78]; LAMY, 1913:354, 364, footnotes.

[non CONRAD, 1837:239; pl. 18, fig. 11].

*Semele quentinensis* Dall, 1921: DALL, 1921:22; DALL, 1925:26, 36; pl. 8, fig. 4; GRANT & GALE, 1931:377; HERTLEIN & STRONG, 1949:240, 246–247, 258; pl. 1, fig. 10; KEEN, 1958:199; fig. 494; OLSSON, 1961:361; KEEN, 1971:253–254; fig. 643 [as a possible synonym of *S. pulchra*]; COAN, 1973:321 [as a synonym of *S. pulchra*].

**Type material and localities:** *A. pulchrum*—BM(NH) 1973087/1, lectotype (COAN, 1973:322), pair; length, 29.0 mm; height, 21.6 mm; convexity, 11.1 mm (Figure 53). BM(NH) 1973087/2, 3, paralectotypes, 2 smaller pairs. Bahía de Caráquez, Guayas Prov., Ecuador (0°35'S, 80°25'W); H. Cuming, 1828–1830.

*A. striosum*—MCZ 186542, holotype, right valve; length, 21.3 mm; height, 17.9 mm; convexity, 3.6 mm [pair would be about 7.2 mm] (Figure 54). Panama, presumably near Panama City (about 8°58'N, 79°32'W); C. B. Adams, 27 Nov. 1850–2 Jan. 1851. (See discussion below.)

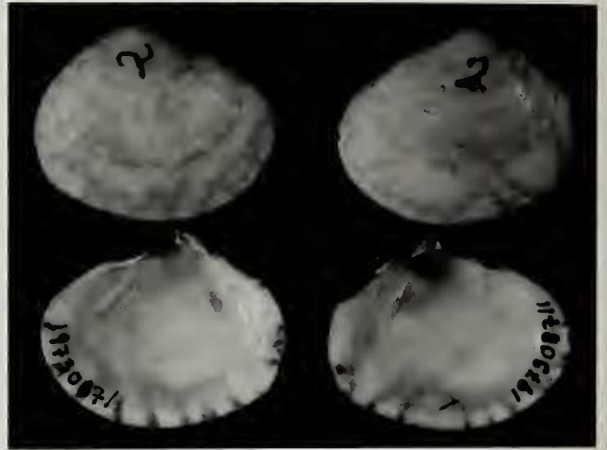
*S. quentinensis*—USNM 333114, lectotype (COAN, 1973:322), right valve; length, 23.9 mm; height, 18.2 mm; convexity, 4.1 mm [pair would be about 8.2 mm] (Figure 55). USNM 645416, paralectotypes, 4 valves. Bahía San Quintín, Baja California Norte (about 30°26'N, 115°56'W); C. R. Orcutt, Nov. 1888.

**Description:** Small (length to 31.9 mm; Skoglund Coll.; Isla Venado, Panama); oblong; equivalve; shells average in thickness; longer, sharply rounded anteriorly; somewhat truncate posteriorly; antero-dorsal margin straight, with a lunule; postero-dorsal margin straight, with an escutch-



51

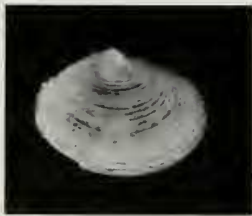
52



53



54



56



57



58



59

60



61

eon. Periostracum thin, light tan. Sculpture of very fine concentric ribs and fine radial rays on anterior slope in both valves. White externally, with purple flecks and rays; white internally, with a suffusion of purple, pink, or yellow; hinge dark purple. Pallial sinuses large.

**Distribution and habitat:** Mugu Lagoon, Ventura Co., California (34°6'N, 119°6'W) (BURCH, 1945a:18); Catalina Island, Los Angeles Co., California (about 33°27'N, 118°28'W) (USNM 194333), southward, but not into the Gulf of California farther north than La Paz, Baja California Sur (24°10'N, 110°19'W) (USNM 150835), and Mazatlán, Sinaloa (23°12'N, 106°24'W) (SBMNH 20993), Mexico, to Zorritos, Tumbes Prov., Peru (3°40'S, 80°34'W) (OLSSON, 1961). I have not seen Olsson's material but there is no reason to doubt this record, and I have seen material from about 1° latitude north of Zorritos at Estero Salitro, Ecuador (CAS 064538). Three lots labeled as having come from Monterey, Monterey Co., California (36°31'N, 121°53'W) (LACM 57172; CAS 064556; ANSP 51756), may either represent the result of larval settlement in an unusually warm year or labeling errors; no populations have been noted there in recent years. From the intertidal zone to 110 m (mean, 15 m), on both mud and sand substrates. I have examined 115 lots.

According to FINÉT (1985:42) this species was recorded from the Galápagos Islands, but he doubts the record, and I have seen no material from there.

This species has been reported in strata of late Pleistocene age from Anacapa Island, Santa Barbara Co., California (VALENTINE & LIPPS, 1963:1294), to Bahía Magdalena, Baja California Sur (JORDAN, 1936:112), with many intermediate records. It has also been recorded in early Pleistocene deposits from the San Pedro, Los Angeles Co., area (for example, SCHENCK, 1945:513).

**Remarks:** The identity of *Amphidesma striosum* C. B. Adams has long been controversial. OLSSON (1961:364)

claimed that Adams' real type had been lost,<sup>2</sup> and he decided on the basis of the original description that the taxon was a synonym of *Semele lenticularis* (with which he also synonymized Adams' *A. bicolor*). He recognized that the specimen thought to be the type of *A. striosum* by CARPENTER (1864a, b), TURNER (1956), and KEEN (1958) was a stray valve of *S. pulchra*, a species also reported by C. B. ADAMS (1852:514–515) from Panama.

C. B. Adams himself provided few clues. *Amphidesma striosum* is not compared with any of the other species possibly involved—all of which he had before him—*A. pulchrum*, *A. bicolor*, and *Semele lenticularis* (as *A. ventricosum* C. B. Adams), and I see little in their descriptions to make a convincing case in favor of any interpretation. The presumed type specimen **can** be construed to match the original description, though the prominent radial sculpture is confined to the anterior end, a fact not mentioned by Adams. The measurements given by Adams are a reasonable match. (His stated measurements were 19.8 mm long, 18.0 mm high, 8.4 mm in convexity; the holotype is 21.3 mm long, 17.9 mm high, and, if both valves were present, about 7.2 mm in convexity.) Other measurements by Adams of his specimens were as far off. In any case, *A. striosum* would end up in synonymy.

Records of *Semele striosa* from California (for example, BURCH, 1945a:17) were based on young specimens of *S. rupicola*.

DALL (1921) did not compare his fossil *Semele quentinensis* with the Recent *S. pulchra*. HERTLEIN & STRONG (1949) recognized *S. quentinensis* from the Recent fauna as a northern species (California to Costa Rica), differing from the southern *S. pulchra* (Nicaragua to Peru) in being (1) more elongate, (2) thinner, (3) lighter in color, and (4) having a more gently sloping antero-dorsal margin. However, variability within this species easily accounts for these supposed differences.

#### *Semele verrucosa* Mörch, 1860

#### *Semele verrucosa verrucosa* Mörch, 1860

(Figures 56–58)

*Semele verrucosa* Mörch, 1860: MÖRCH, 1860:190–191 [as *S. (Amphidesma)*]; KEEN, 1966b:12, 13, 16–17; figs. 17a, b; KEEN, 1971:255–256; fig. 652; BERNARD, 1983:47.

[*non Semele verrucosa* Mörch, *auctt.*, =*S. formosa* (Sowerby)].  
*Semele margarita* Olsson, 1961: OLSSON, 1961:360, 370, 539; pl. 66, fig. 3; KEEN, 1966b:16–17 [as possible synonym of *S. verrucosa*]; KEEN, 1971:255 [as a synonym of *S. verrucosa*].

*Semele guaymasensis* Pilsbry & Lowe, *auctt.*, *non* Pilsbry & Lowe, 1932: OLSSON, 1961:369 [in part], 539; pl. 66, fig. 6.

[*non* PILSBRY & LOWE, 1932:144; pl. 12, figs. 8, 9].

#### Explanation of Figures 51 to 61

Figures 51 and 52. *Semele guaymasensis* Pilsbry & Lowe. Figure 51: **Lectotype** (herein) of *S. guaymasensis*; length, 15.9 mm. Figure 52: ANSP 361643, paralectotype; length, 16.1 mm.

Figures 53–55. *Semele pulchra* (Sowerby). Figure 53: Lectotype of *Amphidesma pulchrum*; length, 29.0 mm. Figure 54: Holotype of *A. striosum* C. B. Adams; length, 21.3 mm. Figure 55: Lectotype of *S. quentinensis* Dall; length, 23.9 mm.

Figures 56–58. *Semele verrucosa verrucosa* Mörch. Figure 56: Lectotype of *S. verrucosa*; length, 10.6 mm. Figure 57: Holotype of *S. margarita* Olsson; length, 14.0 mm. Figure 58: CAS 064536; Playas del Coco, Costa Rica; length, 17.5 mm.

Figures 59–61. *Semele verrucosa pacifica* Dall. Figure 59: Holotype of *S. pacifica*; length, 18.2 mm. Figure 60: Holotype of *S. jaramija* Pilsbry & Olsson; length, 20.9 mm. Figure 61: CAS 064559; Isla Espíritu Santo, Baja California Sur; length, 19.5 mm.

<sup>2</sup> DALL (1915:25, 26) also thought that some of Adams' types of *Semele* were mixed by the time Carpenter saw them and that *Amphidesma striosum* was such a case.

**Type material and localities:** *S. verrucosa*—UZM [no number], lectotype (KEEN, 1966b:12), pair; length, 10.6 mm; height, 8.0 mm; convexity, 3.3 mm (Figure 56). UZM, paralectotype, 1 pair. "Los Bocorones," Gulf of Nicoya, Puntarenas Prov., Costa Rica (approx. 9°50'N, 84°50'W), 37 m; A. S. Oersted, 1846–1848.

*S. margarita*—PRI 25935, holotype, right valve; length, 14.0 mm; height, 11.2 mm; convexity, 2.3 mm [pair would be 4.6 mm] (Figure 57). W side of Isla del Rey, Islas de las Perlas, Panama (approx. 8°20'N, 78°57'W).

**Description:** Small (to 23.7 mm; ANSP 225090; Venado Beach, Panama); oval; equivalve; shells average in thickness; longer, sharply rounded anteriorly; truncate posteriorly; antero-dorsal margin straight, with an elongate lunule and a flattened area adjacent to it; postero-dorsal margin straight, with an escutcheon. Periostracum thin, tan. Sculpture of heavy concentric ribs that sometimes are obsolete on posterior slope (if present, carinate along escutcheon); radial sculpture present at least on anterior ends of both valves (7 or 8 ribs); radial sculpture present on posterior slope of both valves in young specimens, sometimes persisting into adult, but more often obsolete; radial sculpture persisting over entire right valve in some specimens (as in type of *Semele margarita*), giving these specimens a cancellate appearance. Externally white, with tan or purple flecks or rays; beaks with a characteristic purple ray on anterior slope; white within, with purple rays showing through; hinge purple. Pallial sinuses large.

I have also illustrated a typical adult pair from Costa Rica (CAS 064536) (Figure 58).

**Distribution and habitat:** San Juan del Sur, Rivas Prov., Nicaragua (11°15'30"N, 85°53'W) (SDNHM 28857), to Isla Otoque, Islas Bonas (8°36'N, 79°39'W) (LACM 65-21), and Isla del Rey, Islas de las Perlas (8°20'N, 78°57'W) (type of *Semele margarita*; LACM 124444), Panama. Intertidal zone to 23 m (mean, 10 m), on sand. I have examined 23 lots.

CRUZ *et al.* (1980:90) report *Semele pacifica* (Dall) from Estero Salado, Guayas Prov., Ecuador (2°39'S, 80°9'W). Their record might have been based on this subspecies, but without being able to verify their material, I am unable to accept this record; it could have been based on a specimen *S. pulchra* (Sowerby) instead.

**Remarks:** Understanding the relationships within this species complex proved to be a most challenging problem. As additional material becomes available, my tentative conclusions may have to be modified.

Early interpretations of Mörch's *Semele verrucosa* were incorrect and based on misidentifications of *S. formosa* (Sowerby) (COAN, 1983). Only after one of Mörch's specimens was illustrated (KEEN, 1966b) was the correct interpretation possible.

Olsson's *Semele margarita* is a synonym of *S. verrucosa*. It is based on a small right valve that retains a lot of radial sculpture. Such right valves are not uncommon and, in

fact, help to demonstrate the relationship of *S. verrucosa* to the more northerly *S. pacifica* Dall and to account for records of the latter in Panama. (In *S. v. pacifica*, the right valve almost always has abundant radial sculpture, whereas in the left valve the radial rays are confined to the anterior and posterior ends.)

In some adult specimens of *Semele verrucosa verrucosa*, the radial sculpture is confined to the anterior slope of both valves, being overridden on the central slope by concentric sculpture and disappearing on the posterior slope, which becomes flattened. Growth series, the young portions of adult specimens, and variation within lots reveal that only one taxon is present from southern Nicaragua to Panama.

A specimen with only traces of radial sculpture on the posterior slope accounts for Olsson's record of *Semele guaymasensis* from Panama. *Semele guaymasensis*, which has similarly restricted radial sculpture, is at present known only as far south as Jalisco, Mexico. It also has smoother beaks, has no radial sculpture on the posterior slope at any stage, and has concentric sculpture that continues onto the posterior slope, often forming a carina at the margin of the beveled escutcheon.

The tendency of *Semele verrucosa* to lose its radial sculpture—and its relationship to the more northerly *S. pacifica*—is further evidenced by some unusual specimens of the latter from Bahía Cholla, Sonora, Mexico (for example, CAS 064717), in which the radial sculpture is somewhat subdued on the central slope of the right valve; this valve almost always has strong radial sculpture throughout.

I have here interpreted the relationship of the two as subspecies, but it is difficult to know where to draw the line between them. (1) There is no material in collections between Oaxaca, Mexico, and southern Nicaragua. (2) The few lots in collections from southern Mexico are worn valves that are morphologically similar to the southern subspecies. (3) There is one valve labeled as having come from northern Costa Rica (LACM 124443; Puerto Parker) that is indistinguishable from *Semele verrucosa pacifica* from the Gulf of California, but it may be mislabeled.

I hypothesize that *Semele verrucosa verrucosa* is of comparatively recent origin, as explained under *S. v. pacifica* below. *Semele guaymasensis*, rather than *S. v. verrucosa*, is thus compared and may be the most closely related to *S. antiericostata* Vokes from the Miocene of the western Atlantic.

#### *Semele verrucosa pacifica* Dall, 1915

(Figures 59–61)

*Semele pacifica* Dall, 1915: DALL, 1915:27; I. OLDROYD, 1925:180–181; pl. 3, fig. 5; BURCH, 1945a:17; 1945b:17; HERTLEIN & STRONG, 1949:240, 245–246, 258; pl. 1, fig. 11; KEEN, 1958:198–199; fig. 489; OLSSON, 1961:360, 368, 538; pl. 65, fig. 3; KEEN, 1971:251–252; fig.



637; pl. 8, fig. 6; COAN, 1973:325; BERNARD, 1983:26, 69; GEMMELL *et al.*, 1987:56.

*Semele jaramija* Pilsbry & Olsson, 1941: PILSBRY & OLSSON, 1941:70, 79; pl. 17, fig. 5; HERTLEIN & STRONG, 1949: 240, 244, 258; pl. 1, fig. 12; DURHAM, 1950:91, 169, 170; pl. 24, fig. 7; pl. 25, fig. 6; HOFFSTETTER, 1952: 40-41; fig. 8; KEEN, 1958:196-197; fig. 484; OLSSON, 1961:361, 538; pl. 65, fig. 2 [not in main text]; KEEN, 1971:251 [as a synonym of *S. pacifica*].

*Semele hertleini* Durham, 1950: DURHAM, 1950:90-91, 169, 170; pl. 24, fig. 6; pl. 25, fig. 7.

**Type material and localities:** *S. pacifica*—USNM 211728, holotype, a slightly deformed right valve; length, 18.2 mm; height, 14.5 mm; convexity, 3.1 mm [pair would be about 6.2 mm] (Figure 59). Off La Paz, Baja California Sur, Albatross stn. 2822 (24°16'N, 110°22'W), 38 m, gray sand; 30 April 1888.

*S. jaramija*—ANSP 13709, holotype, a broken left valve (not a right, as stated by PILSBRY & OLSSON, 1941); length, 20.9 mm; height, 15.5 mm; convexity, 3.0 mm [pair would be about 6.0 mm] (Figure 60). Punta Blanca, about 8.5 km S of Cabo San Lorenzo, Manabi Prov., Ecuador (1°7'30"S, 80°53'30"W); Canea Formation, Pliocene; A. A. Olsson, 1936-1938.

*S. hertleini*—UCMP 30367/A.3548, holotype, right valve; length, 15.5 mm; height, 11.4 mm; convexity, 2.2 mm [pair would be about 4.4 mm] (not figured here). UCMP 30368/A.3582, paratype, right valve. Seacliffs at south-central end, Isla Coronados, Baja California Sur (26°6'N, 111°17'W); Pleistocene.

**Description:** Small (to 26.6 mm; LACM 69-22; near Puertecitos, Baja California Norte); differing from *Semele v. verrucosa* in having a more elongate outline, finer sculpture, radial sculpture that is present on posterior slope in adults and over the entire surface of right valve.

KEEN (1971:pl. 8, fig. 6) gave an external view of a living specimen. I have illustrated an adult pair from the southern Gulf of California (CAS 064559) (Figure 61).

**Distribution and habitat:** Northeastern end of Isla Cedros, Baja California Norte (28°20'25"N, 115°11'20"W) (LACM 71-152), along the Pacific coast of Baja California, into and throughout the Gulf of California, southward to Puerto Huatulco, Oaxaca (15°44'50"N, 96°8'W) (LACM 38-9). Intertidal zone to 128 m (mean, 28 m), on sand substrates (a few labels note mud). I have examined 131 lots.

DALL's (1915) record from "Catalina Island, California," was based on USNM 73921, which actually came from Isla Santa Catalina in the Gulf of California.

One valve indicated as coming from farther south (LACM 124443; Puerto Parker, Costa Rica) is so much like material from the Gulf of California and so unlike other material from Costa Rica, that it may have been mislabeled.

This species has been reported from the Pleistocene of the Burica Peninsula, Costa Rica/Panama (OLSSON, 1942:

162, as "*S. jaramija*"), but this could have been based on the typical subspecies. It is known from the Pliocene of Ecuador (type locality of *Semele jaramija*), and HOFFSTETTER (1952) reported a pair as a "subfossil" [?Pleistocene] at Santa Elena, Ecuador.

**Remarks:** The synonymy of this subspecies and *Semele hertleini* is obvious. DURHAM (1950) did not compare the two.

HERTLEIN & STRONG (1949) first reported *Semele jaramija* from the Recent fauna. Their material was based on left valves of *S. v. pacifica*, which have radial sculpture confined to the ends. Ironically, HOFFSTETTER (1952) noted the discrepant sculpture in his pair, but he reported this species as *S. jaramija* and did not connect it to *S. pacifica*. KEEN (1971) first took the step of synonymizing the two.

This subspecies must have occurred as far south as Ecuador in the Pliocene and possibly the Pleistocene (Hoffstetter's "subfossil"). It is thus probably older than *Semele v. verrucosa*. No Recent material is as yet known of this subspecies from farther south than Oaxaca, Mexico, with a separable subspecies occurring from Nicaragua to Panama. Its antiquity may also be evidenced by the fact that it is homologous to the western Atlantic *Semele bellestriata* (CONRAD, 1837:239-240; pl. 20, fig. 4), which occurs from the Miocene to the Recent (BOSS, 1972:20-23). The latter has heavier shells than *S. v. pacifica*, and has strong radial sculpture in both valves.

*Semele, s.l.*, no group

*Semele jamesi* Coan, sp. nov.

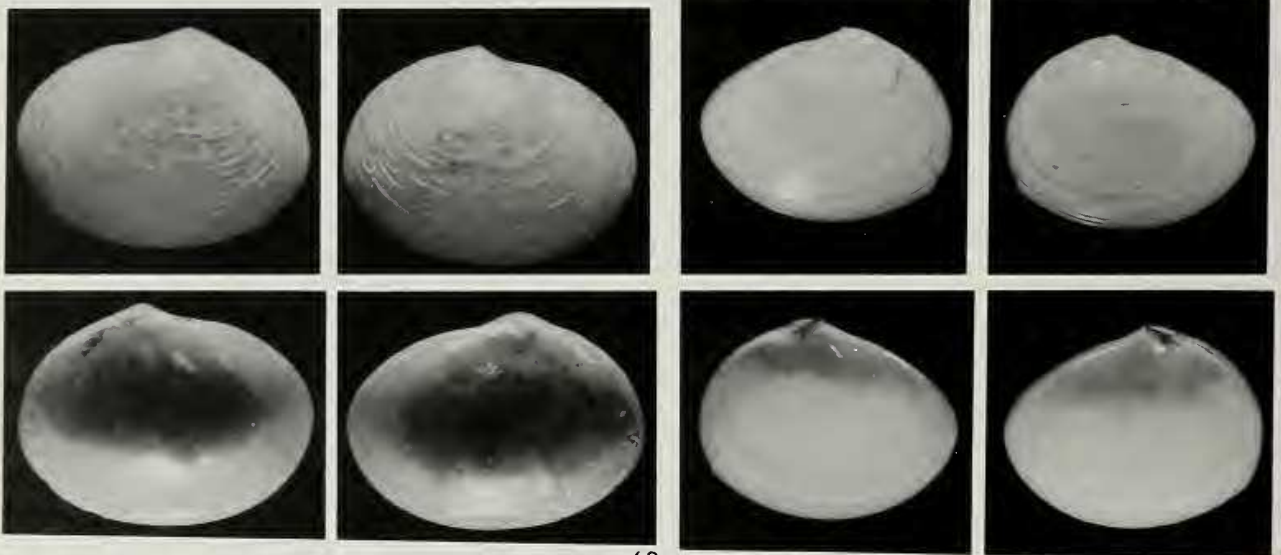
(Figures 62, 63)

**Type material and locality:** SBMNH 34941, holotype, pair; length, 5.4 mm; height, 4.35 mm; convexity, 2.3 mm (Figure 62). SBMNH 34942, paratypes, 28 pairs, 6 right valves, 1 left valve. (Some paratypes to be sent to AMNH, ANSP, BM(NH), SDNHM, and USNM, which lack any specimens of this species.) Bahia Chatham, Isla del Coco, Costa Rica (5°33'N, 87°2'30"W); 46-69 m, in coral rubble; Donald R. Shasky, Michel Montoya, and Kirstie Kaiser, 27 May 1985.

**Description:** Very small for genus (length to 7.3 mm; LACM 66-17; between El Tule and Palmilla, Baja California Sur); oval; equivalve; decidedly inflated; shells average in thickness for size; longer, sharply rounded anteriorly; broadly rounded to slightly truncate posteriorly; antero-dorsal margin with convex flare in young, straighter in adult, with a lunule; postero-dorsal margin slightly convex, with an escutcheon. Periostracum thin, light tan. Sculpture of thin, irregular, well-spaced concentric ribs, those near ventral margin with a frilly edge and often patchy, as if worn off in spots; also with fine radial ribs between concentric ribs. White externally and internally



62



63

64

Explanation of Figures 62 to 64

Figures 62 and 63. *Semele jamesi* Coan, sp. nov. Figure 62: Holotype; length, 5.4 mm. Figure 63: CAS 064566; Bahía San Carlos, Sonora, Mexico; length, 6.6 mm.

Figure 64. *Semele laevis* (Sowerby). Holotype of *Amphidesma laeve*; length, 36.4 mm.

in most, with radial brownish patches, particularly on anterior and posterior slopes. (Some specimens rosy or yellowish, some with brown radial bands.) Hinge not colored. Pallial sinuses large.

I have also illustrated a pair from Sonora, Mexico (CAS 064566) (Figure 63).

**Comparisons:** Shells of this species can most easily be distinguished by their small size. Juvenile shells of *Semele bicolor*, *S. lenticularis*, and *S. flavescens* are flatter and smoother, as is young *S. rosea*. Small *S. jovis* is also flatter, with more regular concentric sculpture. Close examination of the juveniles of *Semele* species that CARPENTER (1857c)

described as "*Tellina lamellata* and "*T. regularis* demonstrate that they are not small *S. jamesi*.

**Distribution and habitat:** Cabo San Lucas, Baja California Sur (22°52'N, 109°53'W) (LACM 66-12, 67-76), throughout the Gulf of California as far north as Puertecitos, Baja California Norte (30°20'N, 114°39'W) (LACM 64-31), and southward to Punta Mala, Manabi Prov., Ecuador (1°34'N, 80°50'W) (SBMNH 34929). It has been recorded from 5 to 161 m (mean, 38 m). This species apparently lives in sandy areas among rocks. I have examined 48 lots.

I suspect that this species may brood its young because of its small size. However, I opened a number of live-collected specimens and could detect no broods in the dried soft parts.

**Remarks:** This species is named for Dr. James H. McLean of the Los Angeles County Museum of Natural History.

**Referred material:**

Collection	Locality	Depth (m)
<i>Baja California Sur</i>		
LACM 67-76	Cabo San Lucas	30
LACM 67-12	Cabo San Lucas	24-35
LACM 66-17	between El Tule & Pamilla	18-37
LACM 66-19	Cabo Pulmo	1.5-6
LACM 66-23	Punta Ventana	18-37
LACM 69-58	Isla Cerralvo	50-200
LACM 66-30	La Paz	37-55
CAS 064562	Isla Espíritu Santo	26-46
SBMNH 34927	Isla Ballaena	11-15
LACM 60-8	Isla Monserrate	46-161
SBMNH 34928	Isla Monserrate	73-146
LACM 78-118	Isla Danzante	23-24
UCMP A.3610	Isla Carmen	31
UCMP A.3613	Isla Carmen	161
CAS 064565	Isla Carmen	unknown
SBMNH 34925	Isla Carmen	16-18
<i>Baja California Norte</i>		
LACM 75-9	Bahía de los Angeles	27
LACM 76-2	Bahía de los Angeles	18-22
LACM 64-31	Puertecitos	7-18
<i>Sonora</i>		
SBMNH 34926	Bahía San Carlos	100
CAS 064566	Bahía San Carlos [figured]	8-23
LACM 64-36	Guaymas	18-37
LACM 77-13	Guaymas	100
LACM 68-13	Guaymas	17-26
CAS 064564	Guaymas	unknown
CAS 064561	Guaymas	49-79
<i>Central Mexico</i>		
LACM 67-12	San Blas, Nayarit	23
LACM 65-16	Bahía Banderas, Jalisco	18-27

LACM 68-45	Cuastocomate, Jalisco	18-37
Skoglund Coll.	Bahía Santiago, Colima	30-61
<i>Costa Rica</i>		
LACM 72-17	Bahía Salinas	1.5-8
LACM 72-19	Bahía Jobo	1.5-11
LACM 72-7	Bahía Santa Elena	1.2-11
LACM 72-8	Bahía Santa Elena	16-29
LACM 72-30	Punta Santa Elena	12-15
LACM 72-40	Bahía Brasilito	18
LACM 72-36	Bahía Huevos	37-42
Skoglund Coll.	Bahía Culebra	12-21
LACM 72-38	Bahía Portrero	8-12
LACM 72-58	Punta Quepos	9-23
LACM 72-64	Isla del Caño	12
SBMNH 34941/2	Isla del Coco [type lot]	46-49
<i>Panama</i>		
LACM 65-25	Isla Taboga	9-27
CAS 064563	Isla Taboga	6-16
<i>Ecuador</i>		
SBMNH 34930	Isla la Plata	30-46
SBMNH 34931	Isla la Plata	30-46
SBMNH 34932	Isla la Plata	30-37
SBMNH 34929	Punta Mala	20

*Semele laevis* (Sowerby, 1833)

(Figure 64)

*Amphidesma laevis* Sowerby, 1833: SOWERBY, 1833a:8; pl. 18, fig. 6; SOWERBY, 1833b:199; REEVE, 1841:68; pl. 48, fig. 6; HANLEY, 1843:44; 6; pl. 12, fig. 10; 1856:341; REEVE, 1853:pl. 7, fig. 50; HANLEY, 1857:pl. 3, fig. 33; TRYON, 1869:120 [*Semele*]; DALL, 1909:271; LAMY, 1913:354, footnote; PILSBRY & OLSSON, 1941:70; HERTLEIN & STRONG, 1949:240, 245; KEEN, 1958:198-199; fig. 487; OLSSON, 1961:359, 361-362, 537; pl. 64, fig. 6; CAUQUOIN, 1969:575-576; KEEN, 1971:251-252; fig. 635; BERNARD, 1983:46.

*Semele laevis costaricensis* Olsson, 1922: OLSSON, 1922:258, 286; pl. 29, fig. 1 [as a "var."]; HODSON & HODSON, 1931:17, 62; pl. 8, fig. 5; OLSSON, 1964:65-66, 216; pl. 9, fig. 9; JUNG, 1969:397-398, 611; pl. 36, figs. 1, 2; WOODRING, 1982:677; pl. 115, figs. 19, 20; pl. 117, fig. 20.

**Type material and localities:** *A. laevis*—BM(NH) 1986072, holotype, pair; length, 36.4 mm; height, 28.0 mm; convexity, 10.5 mm (Figure 64). "Xipixapi" [Jipijapa; just inland from Puerto de Cayo], Manabi Prov., Ecuador (1°20'S, 80°45'W), 18 m, sandy mud; H. Cuming, 1828-1830.

*S. laevis costaricensis*—PRI 21287, holotype, right valve; length, 72.0 mm; height, 65.5 mm; thickness, 8.0 mm [pair would be 16 mm] (not figured here). Hill 3, Río Banano, Limón Prov., Costa Rica (about 9°55'N, 83°10'W); lower Gatun Formation; middle Miocene.

**Description:** Large (to 89.0 mm; Skoglund Coll.; Playas, Guayas Prov., Ecuador; WOODRING (1982) cites a specimen 91.5 mm long, but I have no idea where it is); ovate-elongate; equivalve; shells thin; longer, produced ante-

riorly; rounded, slightly truncate posteriorly; antero-dorsal margin almost straight, with a small, elongate lunule; postero-dorsal margin rounded, with a narrow escutcheon. Periostracum light tan. Smooth externally, with concentric growth lines only. White externally and internally. Pallial sinuses medium-sized.

**Distribution and habitat:** Guaymas, Sonora, Mexico (about 27°55'N, 110°53'W) (CAS 064560), to Zorritos, Tumbes Prov., Peru (3°40'S, 80°40'W) (OLSSON, 1961). The most southerly station from which I have seen specimens is Playas, Guayas Prov., Ecuador (2°39'S, 80°23'W) (CAS 064673), but I see no reason to doubt Olsson's record. From the intertidal zone to 27 m (mean, 18 m), on sand and mud bottoms. I have seen 33 lots.

This species is recorded from Pleistocene strata on the Burica Peninsula, Costa Rica (OLSSON, 1942:10), and the Santa Elena Peninsula, Ecuador (HOFFSTETTER, 1948:80); from a Pliocene formation in Ecuador (PILSBRY & OLSSON, 1941); and from middle Miocene strata in Costa Rica (OLSSON, 1922), Panama (WOODRING, 1982), Ecuador (OLSSON, 1964), Peru (OLSSON, 1932:126), Trinidad (JUNG, 1969), and Venezuela (HODSON & HODSON, 1931).

**Remarks:** Externally, this *Semele* could be mistaken for a *Tellina* or a *Macoma*, but the internal ligament shows its true affinities.

Olsson's variety, *Semele laevis constaricensis*, was originally differentiated from *S. laevis* as being longer and more evenly rounded posteriorly. Later, OLSSON (1964) described its antero-dorsal margin as being more elliptical, longer, straight, and downward sloping; and its anterior end as being more narrowly rounded. JUNG (1969) said that it is smaller, with a narrower pallial sinus, and with shorter, thicker cardinal teeth in the right valve. WOODRING (1982) also said that it is smaller.

The difference in maximum size seems to be of little significance—89.0 mm (perhaps 91.5 mm) for Recent material, 72 mm for Olsson's type, and 75 mm calculated by Woodring for one specimen from the Gatun Formation in Panama. Shell shape in Recent material is quite variable; insufficient material was available to earlier workers. The proportions are also variable in fossil material, as is well illustrated by Woodring (height-length from 0.68 to 0.87); and the shapes of the anterior and posterior ends also differ among specimens. Moreover, I do not see much difference in the shape of the pallial sinuses or the cardinal teeth between the specimen figured by JUNG (1969) and Recent material.

#### Excluded Taxon

*Semele mediamericana* PILSBRY & LOWE (1932:92-93, 144; pl. 12, figs. 1, 1a, 2) was not described from material collected by Lowe as were most other species in that paper but from specimens in the ANSP collection (ANSP 53295), labeled "Nicaragua, McNeil." It subsequently appeared

in other works on the eastern Pacific fauna (HERTLEIN & STRONG, 1949; KEEN, 1958). Contrary to published statements, this specimen was probably not mislabeled; it was merely from the Caribbean coast of Nicaragua. It is a synonym of *S. proficua* (Pulteney, 1799) (Boss, 1972:9, 11).

#### ACKNOWLEDGMENTS

I have many colleagues to thank for help on this project. I particularly appreciated the extensive work of Solene Morris of the British Museum (Natural History) Mollusca Section in locating and documenting the many type specimens housed there. Many other curators and staff at various institutions made material available for study: Academy of Natural Sciences of Philadelphia (Arthur Bogen, Andrea Garback, Robert Robertson), American Museum of Natural History (William K. Emerson, Walter Sage), Australian Museum (Ian Loch), California Academy of Sciences (Michael G. Kellogg, Elizabeth Kools, Robert Van Syoc), Los Angeles County Museum of Natural History (Clif Coney, George Kennedy, James H. McLean), Muséum d'Histoire Naturelle, Geneva (Yves Finét), Muséum d'Histoire Naturelle, Paris (Philippe Bouchet), Museum of Comparative Zoology, Harvard University (Kenneth J. Boss), Naturhistoriska Riksmuseet, Stockholm (Roy Oleröd), Paleontological Research Institution (Peter Hoover), Peabody Museum, Yale University (Willard D. Hartman), Santa Barbara Museum of Natural History (Paul Scott), San Diego Natural History Museum (Anthony D'Attilio, Carole M. Hertz), Seattle Aquarium (Roland Anderson), Tulane University (Emily Vokes), U.S. National Museum of Natural History (Warren Blow, Diane M. Bohmhauer, Frederick J. Collier), Universidad Centroamerica, Managua (Al López), Universitetets Zoologiske Museum, Copenhagen (Tom Schiøtte), University of Alaska Museum (Nora R. Foster), University of California Museum of Paleontology (David R. Lindberg), and Zoologisk Museum, Oslo (Karen Andersen).

A number of private collectors generously made material available or provided records: Rae Baxter, Helen DuShane, LeRoy Poorman, Laura B. Shy, and particularly Donald R. Shasky and Carol C. Skoglund. Advice was also provided by Frank R. Bernard, James T. Carlton, Matthew J. James, Henk K. Mienis, and Cecilia Osorio.

Bertram C. Draper and Barry Roth provided photographic assistance, and Caroline Senour helped prepare the plates. Paul Scott reviewed the manuscript, and Berenice Coan helped proofread it.

#### LITERATURE CITED

All works cited in the text, including sources of taxonomic units, are listed. Volume, bulletin, monograph, memoir, and professional paper numbers are in bold face; series numbers, in parentheses, precede volume numbers; issue numbers, in parentheses, follow volume numbers; supple-

- mentary information, such as second methods of listing volumes, part numbers, and parenthetical statements are given in brackets. Plates are listed, but not text figures, maps, charts, or tables. Exact publication dates are given when possible.
- ADAMS, A. 1854. Descriptions of new species of *Semele*, *Rhizochilus*, *Plotia* and *Tiara* in the Cumingian collection. Zool. Soc. Lond., Proc. for 1853[pt. 21](153-154):94-99 (25 July).
- ADAMS, A. & G. F. ANGAS. 1864. Descriptions of new species from the Australian seas, in the collection of Gense French Angas. Zool. Soc. Lond., Proc. for 1863(3):418-428; pl. 37 (April).
- ADAMS, A. & L. A. REEVE. 1848-1850. Mollusca. x + 87 pp.; 24 pls. In: A. Adams (ed.), The zoology of the voyage of H.M.S. *Samarang*, under the command of Captain Sir Edward Belcher, . . . during the years 1843-1846. Reeve, Benham, & Reeve: London [pp. 1-24; ?pls. 1-9 (Nov. 1848); 25-44; ?pls. 10-13 (May 1850); pp. 45-87, i-x; ?pls. 14-24 (Aug. 1850)].
- ADAMS, C. B. 1852a. Catalogue of shells collected at Panama, with notes on synonymy, station and habitat, . . . Lyc. Natur. Hist. New York, Ann. 5:229-296 (June); 297-549 (July).
- ADAMS, C. B. 1852b. Catalogue of shells collected at Panama, with notes on their synonymy, station, and geographical distribution. Craighead: New York. viii + 334 pp. [a reprint of the above; concerning these works, see CARPENTER, 1864a; TURNER, 1956].
- ADAMS, H. & A. ADAMS. 1856 [1853-1858]. The genera of Recent Mollusca; arranged according to their organization. van Voorst: London. 1:xi + 484 pp.; 2:661 pp.; 3, Atlas:138 pls. [Vol. 2:408 (Nov. 1856)].
- ADDICOTT, W. O. 1966. Late Pleistocene marine paleoecology and zoogeography in central California. U.S. Geol. Surv., Prof. Paper 523C:21 pp.; 4 pls.
- ADEGOKE, O. S. 1969. Stratigraphy and paleontology of the marine Neogene formations of the Coalinga region, California. Univ. Calif. Publ. Geol. Sci. 80:269 pp.; 13 pls. (25 Sept.).
- ARNOLD, R. 1903. The paleontology and stratigraphy of the marine Pliocene and Pleistocene of San Pedro, California. Calif. Acad. Sci., Mem. 3:420 pp.; 37 pls. (27 June) [also issued simultaneously as Stanford Univ., Contrib. to Biol. from the Hopkins Seaside Lab., No. 31].
- BARKER, R. W. 1933. Notes on the Tablazo faunas of S.W. Ecuador. Geol. Mag. 70(824):84-90 (Feb.).
- BERNARD, F. R. 1983. Catalogue of the living Bivalvia of the eastern Pacific Ocean: Bering Strait to Cape Horn. Canadian Spec. Publ. Fisheries & Aquatic Sci. 61:viii + 102 pp. (15 April).
- BOONE, L. 1928. Mollusks from the Gulf of California and the Perlas Islands. Yale Univ., Peabody Mus. Natur. Hist., Bingham Oceanogr. Coll., Bull. 2(5):17 pp.; 3 pls. (Dec.).
- BOSS, K. J. 1972. The genus *Semele* in the western Atlantic. *Johnsonia* 5(49):32 pp.; 12 pls. (25 May).
- BOSS, K. J. 1982. Mollusca. Pp. 945-1166. In: Sybil P. Parker (ed.), Synopses and classification of living organisms. 1. (McGraw-Hill: New York, New York. xviii + 1166 pp.; 87 pls.
- BOSWORTH, T. O. 1922. Geology of the Tertiary and Quaternary periods in the north-west part of Peru, with an account of the palaeontology by Henry Woods, . . . , T. Wayland Vaughan, . . . , & J. A. Cushman, . . . . Macmillan: London. xxii + 434 pp.; 26 pls. (post-March).
- BRANN, D. C. 1966. Illustrations to "Catalogue of the Collection of Mazatlan Shells" by Philip P. Carpenter. Paleo. Resh. Inst.: Ithaca, New York. 111 pp.; 60 pls. (1 April).
- BRODERIP, W. J. & G. B. SOWERBY. (1st). 1832. [. . . the new species of Mollusca and Conchifera collected by Mr. Cuming, . . .] Zool. Soc. Lond., Proc. for 1832[pt. 2](17):50-61 (5 June).
- BRUFF, S. C. 1946. The paleontology of the Pleistocene molluscan fauna of the Newport Bay area, California. Univ. Calif. Publ., Bull. Dept. Geol. Sci. 27(6):213-240 (27 Feb.).
- BRUGUIÈRE, J.-G., J. B. P. A. D. M. D. LAMARCK & J. B. G. M. BORY DE SAINT-VINCENT. 1791-1828. Tableau encyclopédique et méthodique des trois règnes de la nature. Vers, coquilles, mollusques, et polypiers. Agasse: Paris. viii + 180 + 16 pp.; 488 pls. [pls. 287-390 by Lamarck (pre-22 Sept. 1798)].
- BURCH, J. Q. (ed.). 1945a. Family Semelidae. Pp. 16-19. In: Distributional list of the west American mollusks from San Diego, California to the Polar Sea. Part I: Pelecypoda. Conch. Club Southern California, Minutes 43:43 pp. (Jan.).
- BURCH, J. Q. (ed.). 1945b. Family Semelidae in index. P. 17. In: [same as above]. Conch. Club Southern California, Minutes 45:21 pp. (March).
- BURCH, J. Q. (ed.). 1945c. Additions and corrections. In: [same as above]. Conch. Club Southern California, Minutes 46:30 (March).
- CARPENTER, P. P. 1856. Description of new species of shells collected by Mr. T. Bridges in the Bay of Panama and its vicinity, in the collection of Hugh Cuming, Esq. Zool. Soc. Lond., Proc. for 1856[pt. 24](310):159-160; (311):161-166 (11 Nov.).
- CARPENTER, P. P. 1857a. Monograph of the shells collected by T. Nuttall, Esq., on the Californian coast, in the years 1834-5. Zool. Soc. Lond., Proc. for 1856[pt. 24](314):209-224; (315):225-229 (26 Jan.).
- CARPENTER, P. P. 1857b. Report on the present state of our knowledge with regard to the Mollusca of the west coast of North America. British Assoc. Adv. Sci., Rept. 26[for 1856]: 159-368 + 4 pp.; pls. 6-9 (pre-22 April).
- CARPENTER, P. P. 1857c. Catalogue of the collection of Mazatlan shells, in the British Museum: collected by Frederick Reigen, . . . British Museum: London. i-iv + ix-xvi + 552 pp. (1 Aug.) [Warrington ed., viii + xii + 552 pp., published simultaneously] [reprinted: Paleo. Resh. Inst., 1967].
- CARPENTER, P. P. 1864a. Review of Prof. C. B. Adams's 'Catalogue of the Shells of Panama,' from the type specimens. Zool. Soc. Lond., Proc. for 1863(3):339-369 (April) [reprinted in CARPENTER, 1872:173-205].
- CARPENTER, P. P. 1864b. Supplementary report on the present state of our knowledge with regard to the Mollusca of the west coast of North America. Brit. Assoc. Adv. Sci., Rept. 33[for 1863]:517-686 (post-1 Aug.) [reprinted in CARPENTER, 1872:1-172].
- CARPENTER, P. P. 1864-1866. Description of new marine shells from the coast of California. Parts I-III. Calif. Acad. Sci., Proc. I:3:155-159 (July 1864); II:175-176 (Dec. 1864); 177 (Jan. 1865); III:207-208 (post-4 Sept. 1865); 209-224 (Feb. 1866).
- CARPENTER, P. P. 1872. The mollusks of western North America. Embracing the second report made to the British Association on this subject, with other papers; reprinted by permission, with a general index. Smithsonian Inst. Misc. Colln. 10(252):xii + 325 + 13-121 pp. (Dec.).
- CAUQUOIN, M. 1969. Mollusques récoltés par M. R. Hoffstetter sur les côtes de l'Équateur et aux Iles Galapagos. Semelidae et Donacidae. Mus. Nation. d'Hist. Natur., Bull. (2)40(3):574-584 (31 Jan.).

- CHACE, E. P. 1956. Additional notes on the Pliocene and Pleistocene fauna of the Turtle Bay area, Baja California, Mexico. *San Diego Soc. Natur. Hist., Trans.* 12(9):177-180 (11 June).
- CHILDREN, J. G. 1823 [1822-1823]. Lamarck's genera of shells. *Quart. Jour. Sci. Lit. Arts (London)* 14(27):64-87; pls. 3, 4 (Oct. 1822); (28):298-322; pls. 5, 6 (Jan. 1823); 15(29):23-52; pls. 2, 3 (April 1823); (30):216-258; pls. 7, 8 (July 1823); 16(31):49-79; pl. 5 (Oct. 1823); (32):241-264; pl. 6 ("Jan. 1824," but probably Dec. 1823) [concerning: KENNARD *et al.* (1931)].
- CLARK, A. 1931. The cool-water Timms Point Pleistocene horizon at San Pedro, California. *San Diego Soc. Natur. Hist., Trans.* 7(4):25-42 (19 Dec.).
- COAN, E. V. 1973. The northwest American Semelidae. *Veliger* 15(4):314-329; 2 pls. (1 April).
- COAN, E. V. 1983. A *Semele* story (Bivalvia: Semelidae). *Nautilus* 97(4):132-134 (28 Oct.).
- CONRAD, T. A. 1837. Descriptions of new marine shells from Upper California, collected by Thomas Nuttall, Esq. *Acad. Natur. Sci. Philadelphia, Jour.* 7(2):227-268; pls. 17-20 (21 Nov.) [concerning: CARPENTER (1857a), KEEN (1966a)].
- CRUZ P., M., M. D. GONZALEZ, E. GUALANCANAY & F. VILLAMAR. 1980. Lista de la fauna sublitoral de Estero Salado Inferior, Ecuador. *Acta Oceanogr. del Pacifico, INOCAR, Ecuador* 1(1):82-96 (Oct.).
- DALL, W. H. 1871. Descriptions of sixty new forms of mollusks from the west coast of North America and the North Pacific Ocean, with notes on others already described. *Amer. Jour. Conch.* 7(2):93-160; pls. 13-16 (2 Nov.).
- DALL, W. H. 1892. Contributions to the Tertiary fauna of Florida, with especial reference to the Miocene silex-beds of Tampa and the Pliocene beds of the Caloosahatchie River. Part II. Streptodont and other gastropods, concluded. *Wagner Free Inst. Sci. Philadelphia, Trans.* 3(2):201-473; pls. 13-22 (Dec.).
- DALL, W. H. 1900. . . . Part V. Teleodesmacea: *Solen* to *Diplodonta*. *Wagner Free Inst. Sci. Philadelphia, Trans.* 3(5):949-1218; pls. 36-47 (Dec.).
- DALL, W. H. 1909. Report on a collection of shells from Peru, with a summary of the littoral marine Mollusca of the Peruvian zoological province. *U.S. Natl. Mus., Proc.* 37(1704):147-294; pls. 20-28 (24 Nov.).
- DALL, W. H. 1915. Notes on the Semelidae of the west coast of America, including some new species. *Acad. Natur. Sci. Philadelphia, Proc.* 67:25-28 (2 March).
- DALL, W. H. 1921. New shells from the Pliocene or early Pleistocene of San Quentin Bay, Lower California. *West American Scientist* 19(3):21-23 (15 June).
- DALL, W. H. 1925. Illustrations of unfigured types of shells in the collection of the United States National Museum. *U.S. Natl. Mus., Proc.* 66(2554):1-41; pls. 1-36 (22 Sept.).
- DANCE, S. P. 1986. A history of shell collecting. Brill: Leiden. xv + 265 pp.; 32 pls.
- DARWIN, C. R. 1846. Geological observations on South America. Being the third part of the geology of the *Beagle* . . . during . . . 1832 to 1836. Smith, Elder & Co.: London. vii + 279 pp.; 5 pls. [reprinted in several editions].
- DARWIN, C. R. 1962. The voyage of the *Beagle*. Anchor, Doubleday: Garden City, New York. xxxi + 524 pp.; 6 pls. [reprint of 1860 ed.].
- DE GREGORIO, A. 1884. Studi su talune conchiglie Mediterranee viventi e fossili con una rivista del gen. *Vulsella*. *Soc. Malac. Italiana, Bull.* 10:36-288; pls. 1-5.
- DELONG, J. H. 1941. The paleontology and stratigraphy of the Pleistocene at Signal Hill, Long Beach, California. *San Diego Soc. Natur. Hist., Trans.* 9(25):229-252 (30 April).
- DESHAYES, G. P. 1850 [1839-1858]. *Traité élémentaire de conchyliologie avec les applications de cette science à la géologie*. V. Masson: Paris. 1:xii + 368 + 824 pp.; 2:384 pp.; Atlas:80 + xi pp.; 132 pls. [1(2):129-824 (1850)].
- DOELLO-JURADO, M. 1949. Dos nuevas especies de bivalvos marinos. *Mus. Hist. Natur. de Montevideo, Comun. Zool.* 3(57):8 pp.; 1 pl. (16 Nov.).
- D'ORBIGNY, A. D. 1845 [1834-1847]. *Voyage dans l'Amérique Méridionale . . . exécuté pendant les années 1826 . . .* 5(3) [Mollusques]. xliii + 758 pp.; 85 pls. (in Atlas) Bertrand: Paris and Levrault: Strasbourg [pp. 529-600 (1845)].
- DRAPER, B. C. 1987. Lost operculum club list of champions—marine shells of the eastern Pacific Alaska to Chile. *Conch. Club Southern Calif.: Los Angeles, California*. 43 pp. (June).
- DUNKER, W. 1882. *Index molluscorum Maris Japonici*. Fischer: Cassellis. vii + 301 pp.; 16 pls.
- DURHAM, J. W. 1950. 1940 E. W. Scripps cruise to the Gulf of California. Pt. II: Megascopic paleontology and marine stratigraphy. *Geol. Surv. Amer., Mem.* 43:viii + 216 pp.; 48 pls. (10 Aug.).
- DUSHANE, H. 1962. A checklist of mollusks for Puertecitos, Baja California, Mexico. *Veliger* 5(1):39-50 (1 July).
- EMERSON, W. K. & L. G. HERTLEIN. 1964. Invertebrate megafossils of the Belvedere Expedition to the Gulf of California. *San Diego Soc. Natur. Hist., Trans.* 13(7):333-368 (30 Dec.).
- EMERSON, W. K., G. L. KENNEDY, J. F. WEHMILLER & E. KENNAN. 1981. Age relations and zoogeographic implications of late Pleistocene marine invertebrate faunas from Turtle Bay, Baja California Sur, Mexico. *Nautilus* 95(3):105-116 (10 July).
- FINÉT, Y. 1985. Preliminary faunal list of the marine mollusks of the Galápagos Islands. *Inst. Royal Sci. Natur. Belgique, Doc. de Travail* 20:50 pp. (pre-21 March).
- FISCHER, P. 1857. Observations anatomiques sur des mollusques peu connus (suite). *Jour. Conchyl.* 6[(2)2](4):327-339; pl. 13 (Dec.).
- GARDNER, J. A. 1928. The molluscan fauna of the Alum Bluff group of Florida. Part V. Tellinacea, Solenacea, Mactracea, Myacea, Molluscoidea. *U.S. Geol. Surv., Prof. Paper* 142E:185-249 + iv + iii pp.; pls. 29-36 (5 June).
- GAY, C. 1854, 1858. See HUPÉ, L. H. (1854, 1858).
- GEMMELL, J., C. M. HERTZ & B. W. MYERS. 1980. Seastar predation on mollusks in the San Felipe Bay area, Baja California, Mexico. *Festivus* 12(3):24-55 (March).
- GEMMELL, J., B. W. MYERS & C. M. HERTZ. 1987. A faunal study of the bivalves of San Felipe and environs, Gulf of California, from the Gemmell collection (1965 to 1976). *Festivus* 18(Suppl.):72 pp. (26 Feb.).
- GIGOUX, E. E. 1935. Los moluscos marinos de Atacama. *Rev. Chilena Hist. Natur. Pura y Aplicada* 38:274-286.
- GMELIN, J. F. 1791. *Caroli a Linné . . . Systema naturae per regna tria naturae . . . editio decima tertia, acuta, reformata* 1(6). Beer: Leipzig. Pp. 3021-3910 (pre-14 May) [another printing: "Rudolphipoli" on last p., with some text differences].
- GOULD, A. A. 1850. [. . . shells from the Exploring Expedition . . . described by Dr. Gould.] *Boston Soc. Natur. Hist., Proc.* 3(3):214-218 (May).
- GOULD, A. A. 1851. [Descriptions of a number of California shells, collected by Maj. William Rich and Lieut. Thomas P. Green, United States Navy, . . .] *Boston Soc. Natur. Hist., Proc.* 4(4):87-93 (Nov.).

- GOULD, A. A. 1852-1860. Mollusca & shells. *In*: United States Exploring Expedition during the years 1838 . . . 1842. Under the command of Charles Wilkes, U.S.N. 12: xv + 510 pp. ("1851," actually 15 Dec. 1852). Addenda et Corrigenda: \*499-\*510 (1856?). Atlas: 16 pp.; 52 pls. ("1856," actually 15 Dec. 1860) Sherman: Philadelphia [private issue of text: Gould & Lincoln (Boston); private issue of Atlas: Sherman (Philadelphia), but with some differences in plate explanations].
- GOULD, A. A. 1853. Descriptions of shells from the Gulf of California and the Pacific coasts of Mexico and California. *Boston Jour. Natur. Hist.* 6(3):374-408; pls. 14-16 (Oct.).
- GOULD, A. A. 1857. Catalogue of the Recent shells, with descriptions of the new species. *In*: Report on the Geology of the Route, U.S. Pacific Railroad Exploration Reports 5(2), Appendix:330-336; pl. 11 [U.S. 33rd Cong., 2nd Sess., Senate Ex. Doc. 78, House Ex. Doc. 91] (post-6 April) [privately reprinted, 1858].
- GOULD, A. A. 1862. *Otia conchologia*: descriptions of shells and mollusks from 1839 to 1862. Gould & Lincoln: Boston. iv + 256 pp.
- GOULD, A. A. & P. P. CARPENTER. 1857. Descriptions of shells from the Gulf of California, and the Pacific coasts of Mexico and California. Part II. *Zool. Soc. Lond., Proc.* for 1856 [pt. 24](313):198-208 (7 Jan.).
- GRANT, U. S., IV & H. R. GALE. 1931. Catalogue of the marine Pliocene and Pleistocene Mollusca of California and adjacent regions . . . *San Diego Soc. Natur. Hist., Mem.* 1:1036 pp.; 32 pls. (3 Nov.).
- GRAUSTEIN, J. E. 1967. Thomas Nuttall, naturalist. Explorations in America, 1808-1841. *Harvard Univ.: Cambridge, Massachusetts.* xiv + 481 pp.
- GRAY, J. E. 1828-1830. *Spicilegia zoologica*; or, Original figures and short systematic descriptions of new and unfigured animals. Treüttel, Würtz & Co.: London and Wood: Strand. 1:1-8; pls. 1, 2, 5 [pls. 3, 4, 6 never issued, but photocopies of BM(NH) MS plates present in some sets] (1 July 1828); 2:9-12; pls. 7-11 (Aug. 1830).
- HANLEY, S. C. T. 1842-1856. An illustrated and descriptive catalogue of Recent bivalve shells. Williams & Norgate: London. xviii + 392 + 24 pp.; pls. 9-24 [pp. 1-32 (late 1842); pp. 1-32 reissue; 33-144; pls. 9-13; pl. expl. 1-8 (early 1843); 145-272 (late 1843); pls. 14-16; pl. expl. 9-12 (late 1844); pls. 17-19; pl. expl. 13-18 (1846); pls. 20-24; pl. expl. 19-24 (26 July 1855); i-xviii + 273-392 (1856)].
- HANLEY, S. C. T. 1854-1858. The conchological miscellany. Williams & Norgate: London and Edinburgh. [11] pp.; 40 pls. (numbered by genus) [*Amphidesma* section issued 1 Oct. 1857].
- HARTMAN, O. 1963. Submarine canyons of southern California. Part II. Biology. *Allan Hancock Pacific Exped.* 27(2): 424 pp.
- HEILPRIN, A. 1887. Explorations of the west coast of Florida and in the Okeechobee wilderness. *Wagner Free Inst. Sci. Philadelphia, Trans.* 1:vii + 134 pp.; 19 + 2 pls. (May).
- HERM, D. 1969. Marines Pliozän und Pleistozän in Nord- und Mittel-Chile unter besonderer Berücksichtigung der Entwicklung der Mollusken-Faunen. *Zitteliana* [Bayerischen Staatssammlung f. Paläo. und Hist. Geol., Abhandl.] 2:159 pp.; 18 pls. (1 Sept.).
- HERTLEIN, L. G. 1957. Pliocene and Pleistocene fossils from the southern portion of the Gulf of California. *So. Calif. Acad. Sci., Bull.* 56(2):57-75; pl. 13 (31 Aug.).
- HERTLEIN, L. G. & W. K. EMERSON. 1956. Marine Pleistocene invertebrates from near Puerto Peñasco, Sonora, Mexico. *San Diego Soc. Natur. Hist., Trans.* 12(8):154-176; pl. 12 (7 June).
- HERTLEIN, L. G. & U. S. GRANT, IV. 1972. The geology and paleontology of the marine Pliocene of San Diego, California. Part 2B: Paleontology: Pelecypoda. *San Diego Soc. Natur. Hist., Mem.* 2:135-409; frontis.; pls. 27-57 (21 July).
- HERTLEIN, L. G. & A. M. STRONG. 1939. Marine Pleistocene mollusks from the Galapagos Islands. *Calif. Acad. Sci., Proc.* (4)23(24):367-380; pl. 32 (20 July).
- HERTLEIN, L. G. & A. M. STRONG. 1949. Family Semelidae. Pp. 239-251; pl. 1. *In*: Eastern Pacific expeditions of the New York Zoological Soc. XLI. Mollusks from the west coast of Mexico and Central America. Part VIII. *Zoologica* 34(4):239-258; pl. 1 (30 Dec.).
- HERTLEIN, L. G. & A. M. STRONG. 1955a. Marine mollusks collected at the Galapagos Islands during the voyage of the *Velero III*, 1931-1932. *Essays in the Natural Sciences in Honor of Captain Allan Hancock* (Univ. Southern California Press):111-145; pl. A (26 July).
- HERTLEIN, L. G. & A. M. STRONG. 1955b. Marine mollusks collected during the "Askoy" Expedition to Panama, Colombia, and Ecuador in 1941. *Amer. Mus. Natur. Hist., Bull.* 107:159-318; pls. 1-3 (28 Nov.).
- HERTZ, C. M. 1986. Herbert Nelson Lowe, 1880-1936. A gifted amateur conchologist from southern California. *Festivus* 18(3):26-43 (13 March).
- HODSON, F. & H. K. HODSON. 1931. Some Venezuelan mollusks. *Bull. Amer. Paleo.* 16(59):1-94; 24 pls. (1 Oct.).
- HOFFSTETTER, R. 1948. Notas sobre el Cuaternario de la Península de Santa Elena (Ecuador). II. Pelecypoda del Tercer Tablazo. *Quito, Bol. Inform. Cient. Nacion.* 2(13/14):67-83 (Dec.).
- HOFFSTETTER, R. 1952. Moluscos subfósiles de los estanques de sal de Salinas (Pen. de Santa Elena, Ecuador). Comparación con la fauna actual del Ecuador. *Quito, Inst. Cienc. Natur.* 1(1):3-79 (June).
- HOLTEN, H. S. 1802. *Enumeratio systematica conchyliorum beat. J. H. Chemnitz . . . quae publica auctione veduntur die . . . Havniae* (Scidolini). [vi] + 88 pp.
- HUPÉ, L. H. 1854-1858. *Moluscos*. *In*: C. Gay (ed.), *Historia física y política de Chile, . . . Fauna Chilena*. *Zoologia* 8: 499 pp. (1854); Atlas 2:8 + 6 pls. (1858, as "1854").
- JOHNSON, R. I. 1964. The Recent Mollusca of Augustus Addison Gould. *U.S. Natl. Mus., Bull.* 239:182 pp.; 45 pls. (28 July).
- JORDAN, E. K. 1929. Report on fossils from Coquimbo. Pp. 117-119. *In*: B. Willis (ed.), *Earthquake conditions in Chile*. *Carnegie Inst. Washington, Publ.* 382:xi + 178 pp.; 75 pls.; frontis.
- JORDAN, E. K. [with introduction by L. G. Hertlein]. 1936. The Pleistocene fauna of Magdalena Bay, Lower California. *Stanford Univ., Dept. Geol., Contrib.* 1(4):103-173; pls. 17-19 (13 Nov.).
- JUNG, P. 1969. Miocene and Pliocene mollusks from Trinidad. *Bull. Amer. Paleo.* 55(247):289-657; pls. 13-60 (5 Feb.).
- KANAKOFF, G. P. & W. K. EMERSON. 1959. Late Pleistocene invertebrates of the Newport Bay area, California. *Los Angeles Co. Mus. Natur. Hist., Contrib. in Sci.* 31:47 pp. (14 Oct.).
- KEEN, A. M. 1958. Sea shells of tropical west America; marine mollusks from Lower California to Colombia. 1st ed. *Stanford Univ. Press: Stanford, California.* xii + 624 pp.; 10 pls. (5 Dec.).
- KEEN, A. M. 1966a. West American mollusk types at the

- British Museum (Natural History), I. T. A. Conrad and the Nuttall collection. *Veliger* 8(3):167-172 (1 Jan.).
- KEEN, A. M. 1966b. Moersch's west Central American molluscan types with the proposal of a new name for a species of *Semele*. *Calif. Acad. Sci., Occ. Paper* 59:33 pp. (30 June).
- KEEN, A. M. 1968. West American mollusk types at the British Museum (Natural History), IV. Carpenter's Mazatlan collection. *Veliger* 10(4):389-439; pls. 55-59 (1 April).
- KEEN, A. M. 1969. [Families Scrobiculariidae and Semelidae]. Pp. 635-637. In: L. R. Cox *et al.* (eds.), Part N [Bivalvia], *Mollusca* 6, Vol. 2:491-952. In: R. C. Moore (ed.), *Treatise on invertebrate paleontology*. Geol. Soc. Amer. and Univ. Kansas: Lawrence, Kansas. (Nov.).
- KEEN, A. M. 1971. Sea shells of tropical west America; marine mollusks from Baja California to Peru. 2nd ed. Stanford Univ. Press: Stanford, California. xiv + 1064 pp.; 22 pls. (1 Sept.).
- KEEP, J. 1904. West American shells. Whitaker & Ray: San Francisco. 360 pp.; frontis. (post-11 July).
- KEEP, J. 1910. West Coast shells (revised edition). Whitaker & Ray-Wiggin: San Francisco. 346 pp.; frontis.; 3 pls. (Dec.).
- KEEP, J. & J. L. BAILY, JR. 1935. West Coast shells. Stanford Univ. Press: Stanford, California and Oxford Univ.: London. xii + 350 pp. (post-1 Feb.).
- KELLOGG, J. L. 1915. Ciliary mechanisms of lamellibranchs. *Jour. Morphol.* 26(4):625-701 (20 Dec.).
- KENNARD, A. S., A. E. SALISBURY & B. B. WOODWARD. 1931. The types of Lamarck's genera of shells as selected by J. G. Children in 1823. *Smithsonian Inst., Misc. Coll.* 82(17):40 pp. (11 July).
- KEW, W. S. W. 1924. Geology and oil resources of a part of Los Angeles and Ventura counties, California. *U.S. Geol. Surv., Bull.* 753:viii + 202 pp.; 17 pls.
- KOCH, F. C. L. & W. B. R. H. DUNKER. 1837. Beiträge zur Kenntniss de Norddeutschen Oolithgebildes und dessen Versteinerungen. Oehme & Müller: Braunschweig. 64 pp.; 7 pls. (post-May).
- LAMARCK, J. B. P. A. D. M. D. 1798. See BRUGUIÈRE *et al.* (1791-1798).
- LAMARCK, J. B. P. A. D. M. D. 1818. *Histoire naturelle des animaux sans vertèbres*. Vol. 5:612 pp. Verdrière, Deterville, & Lamarck: Paris (25 July).
- LAMY, E. 1908. Coquilles marines recueillies par M. le Dr. Neveu-Lemaire pendant la Mission de Créqui-Montfort et Senechal de la Grange dans l'Amérique de Sud (1903) [suite]. *Mus. Natl. d'Hist. Natur., Bull.* 14(1):44-53.
- LAMY, E. 1910. Mollusques marins recueillies par M. le Dr. Rivet à Payta (Perou). *Mission Serv. Géogr. de l'Armée pour la Mesure d'un Arc de Méridien Équatorial. . .* 9 [Zool.] (3):C79-91. Gauthier-Villars: Paris.
- LAMY, E. 1912. Notes synonymiques sur les *Amphidesma* de Lamarck. *Mus. Natl. d'Hist. Natur. Paris, Bull.* 18(3):159-166 (post-March).
- LAMY, E. 1913. Révision des Scrobiculariidae vivants du Muséum d'Histoire Naturelle de Paris. *Jour. Conchyl.* 61(4):15] (3):243-368; pl. 8 (25 March).
- LINNAEUS, C. 1767. *Systema naturae per regna tria naturae . . . editio duodecima, reformata* 1(2):533-1327. Salvius: Stockholm.
- LISTER, M. 1687 [1685-1692]. *Historiae conchyliorum, . . .* Lister: London. [(1), 1685; (2), 1686; (3), 1687; (Appendix to 3), 1688; (4), 1688; (Appendix to 4), 1692].
- MARINCOVICH, L. 1973. Intertidal mollusks of Iquique, Chile. *Los Angeles Co. Natur. Hist. Mus., Sci. Bull.* 16:49 pp. (20 Feb.).
- MAURY, C. J. 1917. Santo Domingo type sections and fossils. *Bull. Amer. Paleo.* 5(29)[I]:165-284 [1-120] (31 March); 285-416 [121-252]; pls. 1-39 (29 April); (30)[II]:iii + 417-459 [1-43] (29 May).
- MAURY, C. J. 1925. A further contribution to the paleontology of Trinidad (Miocene horizons). *Bull. Amer. Paleo.* 10(42): 153-403 [1-252]; pls. 1-42 (27 March).
- MÖRCH, O. A. L. 1860 [1859-1861]. Beiträge zur Molluskenfauna Central-Amerika's. *Malak. Blätter* 6(4):102-106 (Oct. 1859); 7(2):66-96 (July 1860); (3):97-106 (Aug. 1860); (4):170-192 (Dec. 1860); (5):193-213 (Jan. 1861) [concerning: KEEN (1966b)].
- MONTAGU, G. 1808. *Supplement to Testacea Britannica*. White: London and Woolmer: Exeter. v + 183 + [5] pp.; pls. 17-30 (post-1 Oct.).
- MÜLLER, T. 1836. *Synopsis novorum generum, specierum et varietatum testaceorum viventium anno 1834 promulgatorum*. Nicolai: Berlin. xii + 256 pp.
- NATLAND, M. L. 1957. Paleocology of West Coast Tertiary sediments. Pp. 543-571; 5 pls. In: H. S. Ladd (ed.), *Treatise on marine ecology and paleoecology*. 2 [Paleoecology]. Geol. Soc. Amer., Mem. 67(2):x + 1077 pp. (25 March).
- NICKLÈS, M. 1955. Scaphopodes et lamellibranches récoltés dans l'ouest Africain. *Atlantidae Rept.* 3:93-237.
- NOMLAND, J. O. 1917. The Etchegoin Pliocene of middle California. *Univ. Calif. Publ., Bull. Dept. Geol.* 10(14):191-254; pls. 6-12 (19 April).
- OLDROYD, I. S. 1924. Marine shells of Puget Sound and vicinity. *Univ. Washington, Puget Sound Biol. Station, Publ.* 4:272 pp.; 49 pls. (March).
- OLDROYD, I. S. 1925. The marine shells of the west coast of North America. 1 [Pelecypoda]. *Stanford Univ. Publ., Univ. Ser., Geol. Sci.* 1(1):247 pp.; 57 pls. (Sept.) [reprinted: Stanford Univ., 1978].
- OLDROYD, T. S. 1925. The fossils of the Lower San Pedro fauna of Nob Hill Cut, San Pedro, California. *U.S. Natl. Mus., Proc.* 65(2535):1-39; 2 pls. (16 Jan.).
- OLSSON, A. A. 1922. The Miocene of northern Costa Rica, with notes on its general stratigraphic significance. *Bull. Amer. Paleo.* 9(39)[1]:1-168 (1 April); [2]:169-309; 32 pls. (21 June).
- OLSSON, A. A. 1932. Contributions to the Tertiary paleontology of northern Peru: Part 5, the Peruvian Miocene. *Bull. Amer. Paleo.* 19(68):272 pp.; 24 pls. (30 June).
- OLSSON, A. A. 1942. Tertiary and Quaternary fossils from the Burica Peninsula of Panama and Costa Rica. *Bull. Amer. Paleo.* 27(106):157-258 [5-106]; pls. 14-25 [1-12] (25 Dec.).
- OLSSON, A. A. 1961. Mollusks of the tropical eastern Pacific particularly from the southern half of the Panamic-Pacific faunal province (Panama to Peru). *Panamic-Pacific Pelecypoda*. *Paleo. Resh. Inst.: Ithaca, New York.* 574 pp.; 86 pls. (10 March).
- OLSSON, A. A. 1964. Neogene mollusks from northwestern Ecuador. *Paleo. Resh. Inst.: Ithaca, New York.* 256 pp.; 38 pls. (28 Oct.).
- OSORIO R., C., J. ATRIA C. & S. MANN F. 1979. Moluscos marinos de importancia economica en Chile. *Serv. Nacion. Pesca, Biol. Pesc.* 11:3-47 (Aug.).
- PALMER, K. E. H. (V. W.). 1958. Type specimens of marine Mollusca described by P. P. Carpenter from the West Coast (San Diego to British Columbia). *Geol. Soc. Amer., Mem.* 76:viii + 376 pp.; 35 pls. (8 Dec.).
- PALMER, K. E. H. (V. W.). 1963. Type specimens of marine Mollusca described by P. P. Carpenter from the west coast of Mexico and Panama. *Bull. Amer. Paleo.* 46(211):285-408; pls. 58-70 (22 Oct.).
- PARKER, R. H. 1964a. Zoogeography and ecology of some



- macro-invertebrates, particularly mollusks, in the Gulf of California and the continental slope off Mexico. *Vidensk. Medd. fra Dansk Naturhist. Foren. Bd.* **126**:178 pp.; 15 pls. (17 Feb.).
- PARKER, R. H. 1964b. Zoogeography and ecology of macro-invertebrates of Gulf of California and continental slope of western Mexico. *Amer. Assoc. Petrol. Geol., Mem.* **3**:331-376; 10 pls.
- PEÑA G., G. M. 1971. Zonas de distribución de los bivalvos marinos del Perú. *Univ. La Molina, Anal. Cient.* **9**(3/4): 127-138.
- PHILIPPI, R. A. 1860. Reise durch die Wueste Atacama auf Befehl der Chilenischen Regierung im Sommer 1853-54 unternommen und beschreiben. *Anton: Halle.* x + 192 + 62 pp.; 27 pls. [published simultaneously in Spanish].
- PILSBRY, H. A. & H. N. LOWE. 1932. West Mexican and Central American mollusks collected by H. N. Lowe, 1929-31. *Acad. Natur. Sci. Philadelphia, Proc.* **84**:33-144; 17 pls. (21 May).
- PILSBRY, H. A. & A. A. OLSSON. 1941. A Pliocene fauna from western Ecuador. *Acad. Natur. Sci. Philadelphia, Proc.* **93**: 1-79; pls. 1-19 (9 Sept.).
- PILSBRY, H. A. & E. G. VANATTA. 1902. Papers from the Hopkins Stanford Galápagos Expedition, 1898-1899. XIII. Marine Mollusca. *Wash. Acad. Sci., Proc.* **4**:549-560; pl. 35 (30 Sept.).
- PULTENEY, R. 1799. Catalogues of the birds, shells, and some of the more rare plants of Dorsetshire. *Nichols: London.* 92 pp.; 1 port. (pre-2 July).
- RANSON, G. 1959. Mollusques de la plaine cotière soulevée de Guadalupito, récoltés par M. Bernado Boit. *Jour. Conchyl.* **99**(4)52(2):66-76 (15 May).
- RÉCLUZ, C. A. 1845. Monographie de genre Ligule, *Ligula*. *Soc. Cuvierienne (Paris), Rev. Zool.* **8**(10):377-385 (Oct.); (11):407-417 (Nov.).
- REEVE, L. A. 1841-1842. *Conchologia systematica, or complete system of conchology*: . . . Longman, Brown, Green, & Longmans: London. i:vi + 195 pp.; 129 pls. (1841); 2:337 pp.; pls. 130-300 (1842).
- REEVE, L. A. 1853. Monograph of the genus *Amphidesma*. In: *Conchologia Iconica; or, Illustrations of the shells of molluscous animals* **8**:7 pls. [pls. 1-4 (Oct.); pls. 5-7 (Nov.)].
- RÜEGG, W. 1957. Geologie zwischen Cañete-San Juan, 13°00'-15°24' Südperu. *Geol. Rundsch.* **45**(3):775-858; pl. 18 (Jan.).
- SACCO, F. 1901. I molluschi dei Terreni Terziarii del Piedmonte e della Liguria, pt. **29**:216 pp.; 29 pls. *Clausen: Torino* (June).
- SAY, T. 1822. An account of some of the marine shells of the United States. *Acad. Natur. Sci. Philadelphia, Jour.* **2**:221-224 (June); 225-248 (July); 257-276 (Aug.); 302-320 (Sept.); 321-325 (Nov.).
- SCHENCK, H. G. 1945. Geologic application of biometrical analysis of molluscan assemblages. *Jour. Paleo.* **19**(5):504-521; pls. 66, 67 (4 Oct.).
- SCHRENCK, L. I. 1867. Mollusken der Amur-Landes und des Nordjapanischen Meeres. Reisen und Forschungen im Amur-Lande in den Jahren 1854-1856 im Auftrage der Kaiserl. Akad. Wissensch. zu St. Petersburg ausgeführt und in Verbindung mit mehreren Gelehrten herausgegeben. . . . **2** [*Zool.*](3):259-974; pls. 12-30 (post-Oct.).
- SCHRÖDER, O. 1916. Beiträge zur Anatomie von *Amphidesma solidum*. *Jenaische Zeitschr. f. Naturwissensch.* **54**(1):101-132 (21 July).
- SCHUMACHER, C. F. 1817. *Essai d'un nouveau système des habitations de vers testacés*. *Schultz: Copenhagen.* [iv] + 287 pp.; 22 pls. (post-1 March).
- SMITH, E. A. 1885. Report on the Lamellibranchiata collected by *H. M. S. Challenger*, during the years 1873-76. *Zoology* **13**(35):341 pp.; 25 pls. (post-1 Oct.).
- SMITH, E. A. 1890. Report on the marine molluscan fauna of the island of St. Helena. *Zool. Soc. Lond., Proc. for 1890(2): 247-317; pls. 21-24 (1 Aug.).*
- SOOT-RYEN, T. 1932. The Norwegian Zoological Expedition to the Galapagos Islands 1925, conducted by Alf Wollebaek. II. Pelecypods from Floreana (Sancta Maria) Galapagos Islands. *Oslo, Meddel. f. Zool. Mus.* **27** [Saertrykk av *Nyt Magazin for Naturvidenskaberne* **70**]: 313-324; pls. 1, 2 (30 April).
- SOOT-RYEN, T. 1959. Pelecypoda. Report of the Lund University Chile Expedition. 1948-49, No. 35. *Lunds Universitets Arsskrift (n.s.)* (2)55(6):86 pp.; 4 pls. (18 Feb.).
- SOWERBY, G. B. (1st). 18???. *Species conchyliorum*. Sowerby: London. [This work was cited by SOWERBY (1833a) and others, but it was never actually published. A few proof copies were distributed, and these, or photocopies of them, are in a number of libraries. In these, the numbers on the plates do not match the published citations. The plates on *Amphidesma* were later published by HANLEY (1857), with his own plate explanations.]
- SOWERBY, G. B. (1st). 1832. See BRODERIP & SOWERBY (1832).
- SOWERBY, G. B. (1st). 1833a. A catalogue of the Recent species of the genus *Amphidesma*. Pp. 1-2 [7-8 in 1841 reissue]; pls. 17-19. In: G. B. Sowerby, 2nd, *Conchological illustrations*: . . . Sowerby: London. [iv + 116 pp.]; 200 pls. in 200 parts. Text for each genus paginated separately, and most also reissued in 1841. [*Amphidesma*—all no later than 8 March; most likely dates: pl. 17 (8 Feb. 1833); pl. 18 (15 Feb.); pl. 19, with first issue of text (22 Feb.)].
- SOWERBY, G. B. (1st). 1833b. Characters of new species of Mollusca and Conchifera, collected by Hugh Cuming. *Zool. Soc. Lond., Proc. for 1832*[pt. 2](25):194-202 (13 March).
- SPENGLER, L. 1798. Over det toskallede slaegt Tellinerne. *Copenhagen, Skriv. Naturhist. Selsk.* **4**(2):67-127; pl. 12.
- STANLEY, S. M. 1970. Relation of shell form to life habits of the Bivalvia (Mollusca). *Geol. Soc. Amer., Mem.* **125**: xiii + 296 pp.; 40 pls.
- STEARNS, R. E. C. 1891. List of shells collected on the west coast of South America, principally between the latitudes of 7°30'S. and 8°49'N., by Dr. W. H. Jones, Surgeon, U.S. Navy. *U.S. Natl. Mus., Proc.* **14**(854):307-335 (20 Aug.).
- STEARNS, R. E. C. 1894. The shells of the Tres Marias and other localities along the shores of Lower California and the Gulf of California. *U.S. Natl. Mus., Proc.* **17**(996):139-204 (19 July).
- STOLICZKA, F. 1870 [1870-1871]. Cretaceous fauna of southern India 3: The Pelecypoda, with a review of all known genera of this class, fossil and Recent, . . . *Geol. Surv. India, Mem., Palaeontologia Indica.* xxii + 538 pp.; 50 + 4 pls. [pp. 1-222; pls. 1-12 (1 Sept. 1870); 223-409; pls. 13-28 (1 March 1871); xxii + 409-538; pls. 29-50 (1 Aug. 1871)].
- STRONG, A. M. & L. G. HERTLEIN. 1939. Marine mollusks from Panama collected by the Allan Hancock Pacific Expedition to the Galapagos Islands, 1931-1932. *Allan Hancock Pacific Expeditions* **2**(12):177-245; pls. 18-23 (21 Aug.).
- TAYLOR, J. D., W. J. KENNEDY & A. HALL. 1973. The shell structure and mineralogy of the Bivalvia. II. Lucinacea—Clavagellacea, conclusions. *British Museum (Natur. Hist.), Bull.* **22**(9):253-294; 15 pls. (16 March).
- TOMLIN, J. R. L. B. 1927-28. The Mollusca of the 'St. George' Expedition. I. The Pacific coast of S. America. *Jour. Conch.* **18**(6):153-170 (Dec. 1927); (7):187-198 (May 1928).
- TRYON, G. W., JR. 1869. Catalogue of the family Tellinidae.

- In*: Catalogue and synonymy of the genera, species and varieties of Recent Mollusca, described prior to January 1st, 1867, with dates of publication, references to plates, and localities. Pt. 2. Amer. Jour. Conch. 4(5)[App.]:72-126 (6 May).
- TURNER, R. D. 1956. The eastern Pacific marine mollusks described by C. B. Adams. Harvard Univ., Mus. Comp. Zool., Occ. Papers on Mollusks 2(20):21-135; pls. 5-21 (22 Sept.).
- TYLER, D. B. 1968. The Wilkes Expedition. The First United States Exploring Expedition (1838-1842). Amer. Philos. Soc.: Philadelphia. xvi + 435 pp.
- VALENTINE, J. W. 1958. Late Pleistocene megafauna of Cuyucos, California, with its zoogeographic significance. Jour. Paleo. 32(4):687-696 (22 July).
- VALENTINE, J. W. & J. H. LIPPS. 1963. Late Cenozoic rocky-shore assemblages from Anacapa Island, California. Jour. Paleo. 37(6):1292-1302 (14 Dec.).
- VALENTINE, J. W. & R. F. MEADE. 1961. Californian Pleistocene paleotemperatures. Univ. Calif. Publ. Geol. Sci. 40(1): 1-46 (14 July).
- VERRILL, A. E. 1870. Descriptions of shells from the Gulf of California. Amer. Jour. Sci. (2)49(146):217-227 (March).
- VOKES, H. E. 1938. Upper Miocene Mollusca from Springvale, Trinidad, British West Indies. Amer. Mus. Novitates 988: 28 pp. (16 May).
- VOKES, H. E. & E. H. VOKES. 1962. Pelecypods from Barra de Navidad, Mexico. Nautilus 76(2):61-63 (14 Nov.).
- WEBB, R. W. 1937. Paleontology of the Pleistocene of Point Loma, San Diego County, California. San Diego Soc. Natur. Hist., Trans. 8(24):337-348 (15 June).
- WILLETT, G. 1946. Additional notes on the Pliocene molluscan fauna of Los Angeles City. So. Calif. Acad. Sci., Bull. 45(1): 28-32 (10 June).
- WILLIAMSON, M. B. 1892. An annotated list of the shells of San Pedro Bay and vicinity (With a description of two new species by W. H. Dall). U.S. Natl. Mus., Proc. 15(898): 179-220; pls. 19-23 (2 Aug.).
- WOOD, W. 1815. General conchology; or, A description of shells, arranged according to the Linnean system, . . . 1. Booth: London. lxi + 7 + 246 pp.; 59 + 1 pls.
- WOODRING, W. P. 1982. Geology and paleontology of Canal Zone and adjoining parts of Panama. Description of Tertiary mollusks (Pelecypods: Propeamussiidae to Cuspidariidae; additions to families covered in P306-E; additions to gastropods; cephalopods). U.S. Geol. Surv., Prof. Paper 306F: iv + 541-759; pls. 83-124 (about Sept.).
- WOODRING, W. P. & M. N. BRAMLETTE. 1951. Geology and paleontology of the Santa Maria District, California. U.S. Geol. Surv., Prof. Paper 222:iv + 185 pp.; 23 pls. [as "1950"].
- WOODRING, W. P., R. B. STEWART & R. W. RICHARDS. 1941. Geology of the Kettleman Hills oil field, California: stratigraphy, paleontology, and structure. U.S. Geol. Surv., Prof. Paper 195:v + 170 pp.; 57 pls. (7 June).